PALO ALTO TRANSIT VISION

DRAFT

March 2017

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

With increasing interest in expanding mobility options for residents and workers of all ages, the City of Palo Alto is seeking to develop and implement a citywide fare-free transit system that focuses on innovation, usefulness, and sustainability to maximize car-free mobility and provides convenient accessibility to key destinations and regional connections. The City of Palo Alto also seeks to evaluate and address gaps in transit service which may result from the route modifications or eliminations included in the Draft VTA Next Network.

PURPOSE OF THE PLAN

This study helps move the vision of a citywide fare-free transit system forward by developing an expanded system concept for consideration by elected officials and residents alike. The plan serves as a blueprint for implementing new transit services within the City of Palo Alto that connect residential areas to key employment, shopping, recreation, school destinations. The vision outlined within this plan also seeks to improve regional connectivity with linkages to Caltrain and countywide transit providers (e.g. VTA, SamTrans) and take appropriate measures to address and fill gaps which may be presented by the elimination of some VTA transit service in Palo Alto.

Responding to Draft VTA Next Network Changes

In January 2017, VTA released its Draft Next Network plan, which included modifications and proposed elimination of several transit routes in Palo Alto. Addressing gaps which would result from the VTA Next Network changes in Palo Alto was a key consideration in the development of transit route concepts in this study. VTA is expected to release their Final Next Network plan in April 2017 and may include changes to the proposal for VTA service in Palo Alto. Any changes will be reflected in a new iteration of the Palo Alto Transit Vision.

PALO ALTO SHUTTLE SYSTEM GOALS

To guide development of a transit vision for Palo Alto, three simple yet highly descriptive goals for the system were developed along with specific objectives. These goals help guide the service concept development process and their related objectives allow for further definition and refinement of service characteristics.

1. **Convenient and Accessible** – With all transit trips beginning or ending with a walk trip, all residents and businesses should be within a reasonable walking distance of a transit stop along a route providing frequent, all day service.
2. **Frequent and Reliable** – All transit routes and services within the City should provide frequent and reliable all day service in order to serve the wide variety of trip types that compose overall travel need.

3. **Visibility and Ease of Use –** The system should be convenient to use and serve all important destinations while having friendly and exciting branding that generates awareness.

PLAN DEVELOPMENT PROCESS

This transit vision was developed in close consultation with City of Palo Alto staff, as well as the community of residents and visitors to Palo Alto. The planning process included the following phases:

- **Community Engagement and Market Analysis** (October 2015-January 2016), based on market demand data and the results of a community survey.
- **Concept Development** (January-March 2016), including the development of full list of route concepts using established goals and objectives, findings from community outreach, and market analysis.
- **Concept Screening and Service Plan Development** (February-March 2016), including screening of concepts against goals and service criteria and development of a five-year service plan including phased implementation of additional service. See Appendix B for more on this process.
- **Concept Development Phase 2** (January-February 2017), which is the basis for this version of the transit vision in which concepts are refined in light of release of draft VTA Next Network.

Service Plan

Expansion of the Palo Alto Shuttle system, with consideration of, and adherence to, the stated system goals of vastly improving coverage and frequency, will require a substantial investment well above today's expenditure on shuttle operation. The service plan presented below is considered illustrative and conceptual. Figure 1 describes the preferred variants of current or new routes, developed through the screening of initial concepts and feedback from the community, including the public survey and meetings. These concepts also take into consideration the proposed changes to the VTA transit network in Palo Alto, discussed further in Chapter 4. Additional variants on these routes were considered by staff and can be found in Appendix C.

Figure 1 Concept Service Plan

Route	Current/New Route	Key Destinations
Crosstown A	Current	Stanford Medical Center, Stanford Shopping Center, Palo Alto Transit Center, downtown Palo Alto, Lytton Gardens, Rinconada library, Jordan Middle School, Midtown, JLS Middle School, Mitchell Park and Library, Cubberley, senior residences/centers, San Antonio Caltrain, San Antonio Shopping Center
Crosstown B (VTA 21 Supplemental)	Current	Stanford Shopping Center, Palo Alto Transit Center, downtown Palo Alto, Jordan Middle School, Midtown, JLS Middle School, Mitchell Park and Library, Cubberley, senior residences/centers, San Antonio Caltrain, San Antonio Shopping Center
Embarcadero	Current	Palo Alto Transit Center, downtown Palo Alto, Town & Country Village, Paly High School, Lytton Gardens, Rinconada library, Greer Park, Girls' Middle

		School, Bayshore/Fabian employers, senior residences/centers including Moldaw, Palo Alto Animal Services and Municipal Services
South Palo Alto	New	California Avenue Caltrain, Midtown and Palo Verde neighborhoods, Mitchell Park and Library, Senior residences/centers (i.e. Moldaw Residences), Terman Middle School, Gunn High School, VA Hospital

Service Implementation Concepts

Annual service hour costs are presented for each route concept at two service levels – initial and full. Initial service levels are typically all-day service at 30-minute frequencies without weekend service. Full service indicates all-day service, into the evenings, at 15-minute peak frequencies and the introduction of weekend service at 40-60 minute frequencies.

Full buildout of the system, including 15-minute peak, 30-minute midday, and 30-60 minute evening/weekend service on two existing modified routes and one new route would dramatically increase the total number of revenue hours needed to operate the system. A summary of the concept service changes is provided in Figure 2.

Figure 2 Service Implementation Summary

	Light Level of Service			Full Level of Service		
Route Name	Description of Service	Annual Service Hours	Annual Cost[1]	Description of Service	Annual Service Hours	Annual Cost
Crosstown Route – *Variant A*	7 AM to 7 PM weekday service; 30-minute frequency all day, 40 minute in evenings, no weekend service	11,985	$864,118	7 AM to 9 PM weekday service; 15-minute peak frequency, 30-minute midday and 40-minute evening; 8 AM to 8 PM weekend service with 40-minute frequency	21,705	$1,564,930
Crosstown Route – *Variant B*	6 AM to 10 PM weekday service with 30-minute frequency all day; 8 AM to 8 PM weekend service with 45-minute frequency	14,640	$1,055,544	6 AM to 10 PM weekday service with 30-minute frequency all day; 8 AM to 8 PM weekend service with 45-minute frequency[2]	14,640	$1,055,544
Embarcadero Route	6:50 AM to 7 PM weekday service with 20 minute frequency during peak, no midday service, 40-minute evening; no weekend service	5,228	$376,902	7 AM to 9 PM weekday service with 15-minute frequency in peak, 30-minute frequency in midday and evening; 8 AM to 8 PM service on weekends with 60-minute frequency	11,400	$821,940
South Palo Alto	7 AM to 7 PM weekday service with 30-minute frequency all day and 60-minute evening frequency; no weekend service	8,670	$625,107	7 AM to 9 PM weekday service with 15-minute frequency in peak, 30-minute midday, 60-minute evening; 8 AM to 8 PM weekend service with 60-minute frequency	14,240	$1,026,704

A sample route package incorporating Crosstown Route Variant A, the modified Embarcadero Route, and South Palo Alto Variant A has been produced in Figure 3. This comparison shows the

[1] Assuming service hour cost of $72.10

[2] Based on proposed service specifications on VTA Route 21

operating cost differences between the estimated annual operating costs of the existing shuttle network and both an initial and full service implementation of this sample package.

Figure 3 Sample Route Package and Associated Operating Costs

Route and Variant	Current Annual Operating Costs	Annual Costs – Enhanced Service Level	Annual Costs – Full Service Level
Crosstown A	$281,911	$864,119	$1,564,931
Embarcadero	$252,400	$376,903	$821,940
South Palo Alto	--	$625,107	$1,026,704
TOTAL	$534,311	$1,866,129	$3,413,575

Note: The Embarcadero shuttle is funded in partnership with the Joint Powers Board (JPB). The JPB currently pays 46.5% of the operating cost (up to $117,300 per year). The breakdown of current operating costs is $135,100 per year from the City of Palo Alto and $117,300 from the JPB per year.

As the above table shows, the investment in an expanded shuttle system will require significantly more funding on an annual basis; however, with the elimination of multiple existing VTA routes, expansion of the Palo Alto Shuttle system is important to maintaining strong transit coverage and access for Palo Alto residents and visitors.

2 INTRODUCTION

Palo Alto has had its own shuttle system for many years, providing fare-free "last mile" connections to and from Caltrain and "community shuttle" routes for use by students, seniors, and other riders interested in accessing destinations along the routes. With only three routes currently in operation, not all residents and workers are served by the shuttle, and most trips that are not close enough for walking are made by car, other transit providers, and bike, in that typical order of magnitude.

With increasing interest in expanding mobility options for residents and workers of all ages, the City of Palo Alto is seeking to develop and implement a citywide fare-free transit system that focuses on innovation, usefulness, and sustainability to maximize car-free mobility and provides convenient accessibility to key destinations and regional connections. This study report helps move this vision forward by developing an expanded system concept for consideration by elected officials and residents alike.

PURPOSE OF THE PLAN

The primary purpose of the Palo Alto Transit Vision is to better serve the mobility needs of Palo Alto residents (who live and/or work in the City) and workers. It is also a response to — and was largely informed by — the comments and preferences communicated by the Palo Alto community members who responded to the Palo Alto Shuttle community survey in 2015. The plan serves as a blueprint for implementing new transit services within the City of Palo Alto that connect residential areas to key employment, shopping, recreation, school destinations as well as improve regional connectivity with linkages to Caltrain and countywide transit providers (VTA, SamTrans). Further, it provides a framework for ongoing guidance of future service change efforts through proposed system goals and objectives, service design guidelines, and performance standards.

All service concepts presented in this plan are currently unfunded and would require substantial investment on behalf of the City to realize new routes or expansion of service hours on existing routes. A two-phase implementation strategy is presented as part of this plan to help frame the effort and cost needed to achieve a citywide fare-free transit system.

OVERVIEW OF THE PALO ALTO SHUTTLE

The Palo Alto Shuttle Program began in 1999 and has historically provided free service that included two routes: Crosstown Shuttle Route and Embarcadero Shuttle Route. In 2014, the Phase One expansion of the Palo Alto Shuttle Program introduced a new shuttle route in partnership with the City of East Palo Alto, bringing the total number of shuttle routes in the program to three. However, the East Palo Alto route was discontinued by the City of East Palo Alto in 2016 with some portions replaced by SamTrans route 280. In 2015, the City increased

midday service frequency on the Crosstown Shuttle route to improve the service to local schools and community facilities. The City of Palo Alto currently operates the following two shuttle routes:

- **The Crosstown Shuttle** provides a north-south transit connection from Charleston Road to the Palo Alto Transit Center (University Avenue) via Middlefield Road and several community neighborhoods. This route is funded 100% by the City and operates Monday through Friday during the daytime period, excluding some holidays.

  Average daily ridership on the Crosstown route in February 2016 was 276 boardings per day. This represents a cost of $3.49 per boarding. The Crosstown route had an average 81% on-time performance in fall 2015. Estimated annual cost to operate the existing Crosstown shuttle route is about $282,000.

- **The Embarcadero Shuttle** connects the business parks on the east side of the City along Embarcadero Road to the University Avenue Caltrain Station. The City currently contracts with the Peninsula Corridor Joint Powers Board (JPB) for the Embarcadero Shuttle, which is a part of the Caltrain peak hour commuter shuttle program and subsidized 46.5% by the JPB (including BAAQMD funding). The remaining 53.5 is subsidized by the Palo Alto Shuttle Program. This route operates Monday through Friday.

  Average daily ridership on the Embarcadero route in October 2015 was 268 boardings per day. The cost per boarding and on-time performance statistics are unknown as the City of Palo Alto does not hold the contract or pay the full price of the service. The estimated cost to operate the Embarcadero shuttle is $245,000 per year.

The City contracts the operation of the Crosstown shuttle to MV Transportation. The City's current contract with MV Transportation extends through June 30, 2017. The Caltrain Commuter Shuttle Program operates the Embarcadero Shuttle.

OTHER TRANSIT SERVICES IN PALO ALTO

The Palo Alto Shuttle does not operate within a vacuum within the City, and the other transit agencies and the services they provide must be accounted for when considering expanded shuttle service. The City is also well served by regional transit agencies including Santa Clara Valley Transportation Authority (VTA), SamTrans, Caltrain, and Dumbarton Express (operated by AC Transit). Further, Stanford University operates a robust campus transit program and there are many private shuttles (typically from large tech companies) that also operate in the City, primarily serving Caltrain stations and residential areas.

- VTA provides bus, light rail, and paratransit services throughout Santa Clara County and participates as a funding partner in regional rail service including Caltrain, Capital Corridor, and the Altamont Corridor Express. Within Palo Alto, VTA provides Rapid Bus, local bus, community circulator, and commuter express services. See Chapter 4 for discussion of proposed VTA network changes in Palo Alto.
- SamTrans operates 76 bus routes throughout San Mateo County and into parts of San Francisco and Palo Alto. Within Palo Alto, SamTrans provides local bus, community

circulator, and first/last mile shuttle services. SamTrans also provides transit service to East Palo Alto in lieu of the recently-eliminated East Palo Alto shuttle route.

- Caltrain provides commuter rail service along the San Francisco Peninsula, through the South Bay to San Jose and Gilroy. Palo Alto is served by two stations: Palo Alto Station (downtown) and California Avenue Station. The Palo Alto Station is the second busiest in the Caltrain system.
- Dumbarton Express is a weekday-only transbay bus service operating between Palo Alto, Stanford and Caltrain and Union City BART. This service is operated by AC Transit and consists of two routes, DB and DB2.
- The Stanford Marguerite shuttle operates numerous routes offering first/last mile service to Caltrain, residential areas in the City, areas with high concentrations of ancillary Stanford employment, and local shopping destinations. The Stanford Marguerite shuttles are free to ride and open to anyone.
- Private employers located in Palo Alto and surrounding communities are increasingly providing private commuter buses to their employees. This includes employers such as Google, Facebook, Box, VM Ware, some of which operate on Foothill Expressway and Page Mill Road in Palo Alto.

INTEGRATION WITH VTA NEXT NETWORK

Over the past several years, the City of Palo Alto has looked closely at expansion of the Palo Alto Shuttle as one way to expand mobility and access for residents and workers of all ages. The ultimate vision is a citywide fare-free transit system that focuses on innovation, usefulness, and sustainability to maximize car-free mobility and provides convenient accessibility to key destinations and regional connections.

During the shuttle route concept development process, the express intent was to minimize duplication and overlap with other transit agencies/routes. The first phase of concept development, which took place in spring 2016, was conducted with the best available information at the time. VTA, as part of their Transit Ridership Improvement Program, was still developing and had not yet published their Next Network concepts (Network 70, Network 80, and Network 90).

In January 2017, VTA released a draft plan which focused on an 85/15 resource split, with the largest portion going toward higher ridership routes to increase frequency and the smaller portion funding routes serving coverage goals. As a result, some routes in Palo Alto are proposed for elimination and/or modification. Thus, the purpose of this study effort is to revisit and update the draft 5-year service plan to be responsive to and complement the adopted Next Network. In order to meet the City's own coverage and frequency goals for transit access and mobility, new and/or modified routes have been explored and developed, and are outlined in the transit vision Chapter 5. Staff expect that a revised VTA Next Network Plan will be released in Spring 2017 which will include revisions reflecting an 83/17 split in allocated resources. A future iteration of this plan will react to any major changes in service provision in Palo Alto.

REPORT ORGANIZATION

The Palo Alto Transit Vision consists of six chapters, which are summarized below.

- Chapter 1 provides an executive summary of the report.

- Chapter 2 presents an introduction to the context, goals, and processes used in development of this plan.
- Chapter 3 reviews existing transit services within the City of Palo Alto in more depth and offers an analysis of peer systems.
- Chapter 4 summarizes the Draft VTA Next Network plan and the implications of the network changes in Palo Alto.
- Chapter 5 presents the shuttle system's guiding goals and objectives and presents proposed performance standards.
- Chapter 6 describes the next steps, as well as consideration of an additional route and other service models the City could consider instead of providing fixed-route shuttle service
- Appendix A offers insight on the community profile of Palo Alto.
- Appendix B describes the process of developing and screening initial service improvement concepts during phase one of this effort in Spring 2016.
- Appendix C includes maps and specifications of additional route variants considered by staff for the Embarcadero and South Palo Alto routes.

3 CURRENT TRANSIT CONDITIONS

Public transit in Palo Alto is provided by a wide variety of operators and many service types, including fixed route, long distance commuter shuttle, first/last mile shuttle, community circulator, and school service. Palo Alto is also served by two Caltrain (commuter rail) stations. The Palo Alto Station (downtown) is an exceptionally important multimodal transit hub, generating the second highest commuter rail ridership in the Caltrain system while connecting with Palo Alto Shuttle, Stanford Marguerite, VTA, SamTrans, Dumbarton Express, and private employer shuttles. This chapter reviews existing services within the City.

PALO ALTO SHUTTLE ROUTES

The Crosstown Shuttle provides a north-south transit connection from Charleston Road to the Palo Alto (University Avenue) Caltrain station along Middlefield Road and several community neighborhoods. This route serves both JLS and Jordan middle schools during the morning and afternoon bell schedules. Crosstown Route currently operates on one-hour headway during most of the day, except for the morning and mid-afternoon school bell schedule period when there is additional service to support school activity. This route is funded 100% by the City's General Fund and operates Monday through Friday, excluding some holidays, from 7:40AM- 5:30PM.

Average daily ridership on the Crosstown route in February 2016 was 276 boardings per day. This represents a cost of $3.49 per boarding. The Crosstown route had an average 81% on-time performance in fall 2015. The stimated annual cost to operate the existing Crosstown shuttle route is about $282,000.

The Embarcadero Shuttle connects the business parks on the east side of the City along Embarcadero Road to the Palo Alto (University Avenue) Caltrain Station. The City currently contracts with the Peninsula Corridor Joint Powers Board (JPB) for the Embarcadero Shuttle, which is a part of the Caltrain peak hour commuter shuttle program and subsidized 46.5% (up to $117,300) by the JPB. The remainder 53.5% is subsidized by Palo Alto (the General Fund). The shuttle operates on 15- minute headway Monday through Friday from 6:50AM-9:50AM and 3:10PM-6:50PM, excluding some holidays. The Embarcadero Shuttle includes a special run to Jordan Middle School to supplement the Crosstown Shuttle service to/from the school.

Average daily ridership on the Embarcadero route in October 2015 was 268 boardings per day. The cost per boarding and on-time performance statistics are unknown as the City of Palo Alto does not hold the contract or pay the full price of the service. The estimated cost to operate the Embarcadero shuttle is $245,000 per year.

Recently Discontinued

The East Palo Alto Shuttle began operation on July 1, 2014 and linked the University Avenue Caltrain Station with Woodland Avenue community in East Palo Alto. This route was funded by the City of East Palo Alto but managed by the City of Palo Alto. It operated on 30-minute headways, seven days per week, excluding some holidays, from approximately 6:00AM to 10:00AM and 4:00PM-9:00PM. At the request of East Palo Alto, the route was discontinued in September 2016. SamTrans Route 280 was modified to address coverage gaps left by the elimination of the East Palo Alto shuttle route.

Figure 4 Overview of Current Palo Alto Shuttles

Route Name	Route	Operator	Managed By	Funded By	Headways and Service Days	Ridership	Service Hours	Estimated Annual Cost	Points of Interest
Crosstown Shuttle	University Ave/Downtown - South Palo Alto @ Charleston Road, via Middlefield	MV Transportation	City of Palo Alto	City of Palo Alto	60 min Weekdays, except holidays	276 boardings per day (February 2016)	Weekdays: 7:40 AM – 5:20 PM Weekends: no service	$282,000	Palo Alto Transit Center, Avenidas, Lytton Gardens, Channing House, Main Library, Palo Alto Art Center, Jordan Middle School, Midtown Shopping District, JLS Middle School, Mitchell Park Community Center + Library, Stevenson House
Embarcadero Shuttle	University Ave. Caltrain - Baylands Business Park, via Embarcadero	Caltrain Commuter Shuttle Program	Caltrain Commuter Shuttle Program	BAAQMAD, Peninsula Joint Powers, City of Palo Alto	15-20 min Weekday peak, except holidays	268 boardings per day (October 2015)	Weekdays: 6:51-9:34 AM & 3:10-6:28 PM Weekends: no service	$245,000	E. Bayshore, Embarcadero Road, Palo Alto High School, Jordan Middle School, Palo Alto Medical Foundation

OTHER OPERATORS WITHIN PALO ALTO

The City is also served by regional transit agencies including Santa Clara Valley Transportation Authority (VTA), SamTrans, Caltrain, and Dumbarton Express (operated by AC Transit). Further, Stanford University operates a robust campus transit program and there are many private shuttles (typically from large tech companies) that also operate in the City, primarily serving Caltrain stations and residential areas, including Google, Facebook, Box, VMware, and others. Figure 7 lists the universe of routes that serve Palo Alto operated by other agencies.

The following section details ridership and productivity of routes serving Palo Alto, in order to gain additional understanding into the current usage and potential of the transit market to, from, and within the City. Based on availability, data ridership is summarized at the route level. Many routes provided by other operators travel on significant portions of roadway outside the City proper.

VTA

VTA reports ridership and productivity in their annual transit service plan, most recently for FY 2016 – FY 2017. Standards are based on the average productivity of each route service type – core, local, community, and express. Routes operating below the standard are typically an indicator or need for improvement, but is not a hard cut off. Instead, VTA operates with a minimum productivity standard of 15 boardings per revenue hour for all routes.

Figure 5 VTA Ridership

Route Serving Palo Alto	Weekday Ridership	Boardings per Revenue Hour
22	12,929	32.2
35	1,068	16.5
88/88L/88M	207	12.5
89	130	23.5
101	77	19.3
102	314	22.4
103	198	24.8
104	90	22.5
182	28	14.0
522	5,228	21.5

Source: Transit Service Plan FY 2016- FY 2017, VTA Service & Operations Planning, May 2015

VTA released a proposed re-imagination of its network in January 2017 called the VTA Next Network. The Next Network proposes elimination or modification of a number of existing VTA routes in Palo Alto. See chapter 4 for detailed discussion of the implications of the Next Network changes in Palo Alto.

SamTrans

SamTrans has seen some declines in ridership related to the local economy in San Mateo County and recovery from the Great Recession, but those declines have now leveled off. Overall the system averages 26.1 boardings per revenue hour.

Figure 6 SamTrans Ridership

Route Serving Palo Alto	Weekday Ridership	Boardings per Revenue Hour
280	226	10.6
281	790	12.4
297	58	11.5
397	210	42.1
ECR	12,460	37.3

Source: San Mateo County Transit District Short Range Transit Plan Fy2014 - Fy2023, SamTrans, December 2014

Dumbarton Express

In February 2014, average weekday ridership on Dumbarton Express was roughly 1,300 boardings, split nearly evenly between the two routes DB and DB1.[3] No other detailed productivity information was available at time of this study.

Caltrain

Caltrain ridership has been steadily increasing since the introduction of the Baby Bullet (2004), with only a slight blip during the Great Recession. The Palo Alto Station and California Avenue Station rank number 2 and 12 in the system, in terms of weekday ridership, respectively. Almost 7,200 boardings were recorded at the Palo Alto Station while the California Avenue Station saw over 1,500 on a daily basis. These riders are primarily last mile, meaning they arrive at each station and require a last mile shuttle (Embarcadero, Marguerite, etc.) to reach their destination. For riders leaving one of these stations as their first trip, station parking is provided, but first mile shuttle service is also highly valued by providing car free mobility to this regional high-capacity transit connection.

Stanford Marguerite

Stanford University operates an extensive transit network within Palo Alto and nearby communities called the "Marguerite". These routes are free for use by University affiliates and the public alike. The full list of routes, as well as recent ridership data, is shown in Figure 7. Ridership on all Marguerite routes in 2016 included about 3.2 million boardings. Average ridership on all routes was 272,421 boardings per month in 2016.

[3] Dumbarton Express Operations Update, AC Transit, March 2014.

Figure 7 Other Existing Transit Serving Palo Alto

Route Name	Route	Operator	Managed By	Funded By	Headways	Service Days	Service Hours - Weekdays	Service Hours - Weekends	Ridership (Boardings Per Revenue Hour)
Valley Transportation Authority (VTA)[4]									
22	Palo Alto Transit Center to Eastridge Transit Center via El Camino	VTA	VTA	VTA	10-15 min (daytime)	Daily	24 hours	24 hours	32.2
35	Downtown Mountain View to Stanford Shopping Center	VTA	VTA	VTA	30-60 min	Daily	5:42 AM – 10:46 PM	8:23 AM – 8:59 PM	16.5
88	Palo Alto Veteran's Hospital to Middlefield & Colorado	VTA	VTA	VTA	60 min	Weekdays	6:32 AM – 6:39 PM	None	12.5
88L	Palo Alto Veteran's Hospital to Middlefield & Colorado (School Days Only)	VTA	VTA	VTA	None	School Day Peaks	7:38-8:06 AM & 2:29-4:12 PM	None	12.5
88M	Palo Alto Veteran's Hospital to Middlefield & Colorado (School Days Only)	VTA	VTA	VTA	None	School Day Peaks	7:43-8:06 AM & 2:29-4:08 PM	None	12.5
89	California Avenue Caltrain to Palo Alto Veterans Hospital (via Stanford Research Park)	VTA	VTA	VTA	30 min	Weekdays	6:36 AM – 6:38 PM	None	23.5
101	Camden & Highway 85 to Palo Alto	VTA	VTA	VTA	60 min	Weekday Peaks	6:16-8:20 AM & 4:10-6:42 PM	None	19.3

[4] Note proposed VTA network changes released in January 2017. See Chapter 4 for explanation of implications on VTA routes serving Palo Alto.

Route Name	Route	Operator	Managed	Funding	Headways	Service Days	Service Hours - Weekdays	Service Hours - Weekends	Ridership (Boardings per Revenue Hour)
102	South San Jose to Palo Alto	VTA	VTA	VTA	8-30 min	Weekday Peaks	5:50-9:01 AM & 3:25-6:51 PM	None	22.4
103	Eastridge Transit Center to Palo Alto	VTA	VTA	VTA	30-60 min	Weekday Peaks	5:08-8:23 AM & 2:41-6:29 PM	None	24.8
104	Penitenicia Creek Transit Center to Palo Alto	VTA	VTA	VTA	30-45 min	Weekday Peaks	5:54-7:55 AM & 4:00-6:05 PM	None	22.5
182	Palo Alto to IBM/Bailey Ave	VTA	VTA	VTA	None	Weekday Peaks	7:29-8:33 AM & 5:05-6:14 PM	None	14.0
Rapid 522	Palo Alto Transit Center to Eastridge Transit Center	VTA	VTA	VTA	15-30 min	Daily	4:37 AM – 11:16 PM	7:50 AM – 11:09 PM	21.5
Dumbarton Bridge Regional Operations Consortium									
DB	Dumbarton Express	AC Transit (MV Transportation)	Dumbarton Bridge Regional Operations Consortium (DBROC): AC Transit, BART, SamTrans, Union City Transit, VTA	Regional Measure 2	30-60 min	Weekdays, except holidays	5:22 AM – 8:51	None	1,300 (average weekday ridership in February 2014 on both DB and DB1)

Route Name	Route	Operator	Managed	Funding	Headways	Service Days	Service Hours - Weekdays	Service Hours - Weekends	Ridership (Boardings per Revenue Hour)
DB1	Dumbarton Express	AC Transit (MV Transportation)	Dumbarton Bridge Regional Operations Consortium (DBROC): AC Transit, BART, SamTrans, Union City Transit, VTA	Regional Measure 2	20-60 min	Weekday peaks, except holidays	5:26-9:45 AM & 1:35-8:43 PM	None	1,300 (average weekday ridership in February 2014 on both DB and DB1)
SamTrans									
280	Purdue / Fordham – Stanford Mall	SamTrans	San Mateo County Transit District	San Mateo County Transit District	60 min	Daily	5:20 AM – 10:24 PM	7:38 AM – 7:57 PM	10.6
281	Onetta Harris Center – Stanford Mall	SamTrans	San Mateo County Transit District	San Mateo County Transit District	15-30 min	Daily	6:00 AM – 10:32 PM	8:03 AM – 7:58 PM	12.4
297	Redwood City Transit Center –Palo Alto Transit Center	SamTrans	San Mateo County Transit District	San Mateo County Transit District	60 min	Nightly	10:43 PM – 5:21 AM	6:45 PM – 9:22 AM	11.5
397	San Francisco – Palo Alto Transit Center	SamTrans	San Mateo County Transit District	San Mateo County Transit District	60 min	Nightly	12:48 AM – 6:22 AM	12:48 AM – 6:22 AM	42.1
ECR	Daly City BART – Palo Alto Transit Center	SamTrans	San Mateo County Transit District	San Mateo County Transit District	10-30 min	Daily	3:56 AM – 2:21 AM	4:47 AM – 2:21 AM	37.3

Route Name	Route	Operator	Managed	Funding	Headways	Service Days	Service Hours - Weekdays	Service Hours - Weekends	Ridership (Yearly Total – 2016)
Stanford Marguerite Routes									
1050 A	Medical School Office Building –Arastradero Road	Stanford University	Stanford University	Stanford University and numerous contributors	20 min	Weekdays, except holidays	7:05 AM – 6:45 PM	None	87,412
BOH	Menlo Park Caltain – Bohannon	Stanford University	Stanford University	Stanford University and numerous contributors	30 min	Weekdays, except holidays	7:01 AM – 6:33 PM	None	66,061
C	Vi! – Serra Mall – Escondido Village	Stanford University	Stanford University	Stanford University and numerous contributors	30 min	Weekdays, except holidays	5:40 AM – 9:17 PM	None	131,988
HD	Hoover Pavilion Shuttle	Stanford University	Stanford University	Stanford University and numerous contributors	7 min	Weekdays	4:06 AM – 1:38 AM	None	410,028
MC (MCH)	Palo Alto Transit Center – Stanford Hospital Fountain	Stanford University	Stanford University	Stanford University and numerous contributors	15-20 min	Weekdays	5:05 AM – 9:04 PM	None	191,550 (MC) 8,384 (MCH)
N	Campus – Downtown Palo Alto (Counter-Clockwise)	Stanford University	Stanford University	Stanford University and numerous contributors	40 min	Nightly, except holidays and Summer	8:10 PM – 1:38 AM	8:10 PM – 1:38 AM	7,257
O	Campus – Downtown Palo Alto (Clockwise)	Stanford University	Stanford University	Stanford University and numerous contributors	40 min	Nightly, except holidays and Summer	8:25 PM – 1:57 AM	8:25 PM – 1:57 AM	7,089

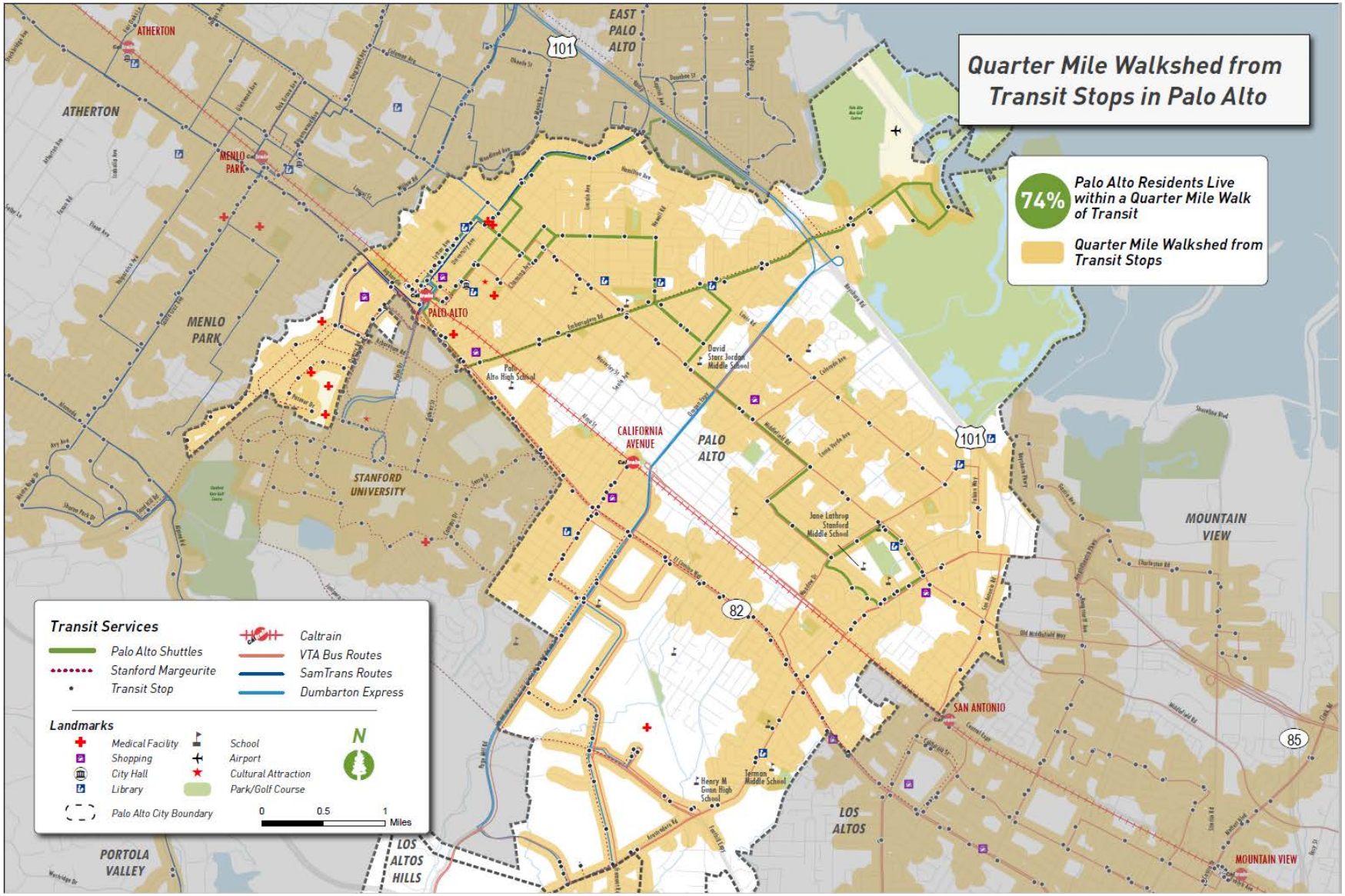
Route Name	Route	Operator	Managed	Funding	Headways	Service Days	Service Hours - Weekdays	Service Hours - Weekends	Ridership (Yearly Total – 2016)
OCA	Tresidder Union – Oak Creek Apartments	Stanford University	Stanford University	Stanford University and numerous contributors	20 min	Nightly, except holidays and summer	9:00 PM – 2:10 AM	9:00 PM – 2:10 AM	3,198
P	Palo Alto Transit Center – Stanford Oval	Stanford University	Stanford University	Stanford University and numerous contributors	10-20 min	Weekdays, except holidays	6:08 AM – 8:10 PM	None	266,555
R	California Avenue – Stanford Research Park	Stanford University	Stanford University	Stanford University and numerous contributors	25 min	Weekdays, except holidays	10:00 AM to 3:00 PM	None	1,365
RP	Palo Alto Transit Center – Research Park	Stanford University	Stanford University	Stanford University and numerous contributors	10-40 min	Weekday peaks	6:28-10:12 AM & 3:30-7:33 PM	None	131,008
S	Palo Alto Transit Center – Stanford West Apartments – Oak Creek Apartments – Rosewood Hotel	Stanford University	Stanford University	Stanford University and numerous contributors	45 min	Weekday peaks, except holidays	6:20-9:07 AM & 4:34-6:47 PM	None	16,342
SE	Palo Alto Shopping Center – Campus – San Antonio Shopping Center	Stanford University	Stanford University	Stanford University and numerous contributors	35-60 min	Daily, except holidays and Summer	3:00 PM – 10:25 PM	9:35 AM – 11:08 PM	90,297
SLAC	SLAC – Hoover Tower	Stanford University	Stanford University	Stanford University and numerous contributors	20-60 min	Weekdays, except holidays	7:00 AM – 9:26 PM	None	73,351
TECH	Palo Alto Transit Center – Embarcadero Road – Palo Alto Technology Center	Stanford University	Stanford University	Stanford University and numerous contributors	10-30 min	Weekday peaks	6:30-10:20 AM & 2:40-7:25 PM	None	41,408

Route Name	Route	Operator	Managed	Funding	Headways	Service Days	Service Hours - Weekdays	Service Hours - Weekends	Ridership (Yearly Total – 2016)
VA	Stanford Hospital – Campus – California Avenue Caltrain Station – Palo Alto VA Hospital	Stanford University	Stanford University	Stanford University and numerous contributors	25-45 min	Weekdays	6:30 AM – 9:37 PM	None	27,981
X	Palo Alto Transit Center – Stanford Shopping Center –Campus (Counter-Clockwise)	Stanford University	Stanford University	Stanford University and numerous contributors	15-20 min	Weekdays, except holidays	5:51 AM – 8:59 PM	None	508,160
Y	Palo Alto Transit Center – Stanford Shopping Center –Campus (Clockwise)	Stanford University	Stanford University	Stanford University and numerous contributors	15-20 min	Weekdays, except holidays	6:08 AM – 8:59 PM	None	521,472
AE-F/U	Fremont BART – Stanford Oval –Stanford Shopping Center	Stanford University / AC Transit	Stanford University / AC Transit	Stanford University / AC Transit	30-60 min	Weekday Peaks	6:00-9:26 AM & 2:45-7:03 PM	None	139,443
Caltrain									
Deer Creek Shuttle	Palo Alto Transit Center – California Ave Caltrain Station –Deer Creek	Caltrain	Caltrain	Bay Area Air Quality Management District Transportation Fund for Clean Air, Peninsula Corridor Joint Powers Board, Hewlett-Packard	20-60 min	Weekday Peaks	7:33-10:01 AM & 3:38-7:01 PM	None	About 7,200 daily boardings at Palo Alto station About 1,500 daily boardings at California Avenue station

TRANSIT ACCESS WITHIN PALO ALTO

In addition to the Palo Alto Shuttle, five other transit operators provide service in Palo Alto — SamTrans, VTA, Dumbarton Express, and Stanford's Marguerite Shuttle (which is also free to the community). Given the presence of many operators, an analysis of access to existing transit service found that 74% of Palo Alto residents are within a quarter-mile walk of a bus stop in Palo Alto (Figure 8) along routes that provide intracity (within Palo Alto) service. Gaps identified as part of this exercise, and shown in the below figure, informed the goals and the subsequent route development process of the Palo Alto Transit Vision.

Figure 8 Access to Transit within a Quarter-Mile in Palo Alto



4 VTA NEXT NETWORK

When developing new or modified route concepts for the Palo Alto Shuttle network, the initial intent was to minimize duplication and overlap with other transit agencies/routes and expand coverage into areas of the City currently without transit service. During an initial concept development process conducted in spring 2016, VTA was still developing internally their Next Network concepts as part of their Transit Ridership Improvement Program (TRIP).

Fast forwarding to January 2017, VTA has now released its Draft Next Network Plan, which focuses on a reduction in coverage-based transit service in order to provide more robust and frequent service to higher ridership routes within the VTA service area.[5] This is proposed through introduction of an 85/15 approach to funding allocation, with 85% of operating funds being used to improve higher ridership routes and 15% funding routes serving coverage goals. The implications of the proposed transit network modifications for Palo Alto include elimination of multiple local transit routes, as described in Figure 9.[6]

Transit provided by VTA in Palo Alto today, as well as the Next Network proposed changes, are shown in Figure 10. As shown below, the first iteration of the Next Network proposal identified VTA Route 89 for discontinuation. However, through subsequent conversations with VTA staff, Route 89 is expected to be retained in future proposals.

Figure 9 VTA Transit Route in Palo Alto

Route Number	Description of Change	Routing Change	Frequency Change
21	New Route 21 would connect Downtown Palo Alto with San Antonio Shopping Center, Downtown Mountain View, Downtown Sunnyvale and Santa Clara Caltrain station. New Route 21 would replace current Routes 32 and 35.	N/A	N/A
22	Route will remain but frequency will be reduced.		X
35	Current Route 35 will be discontinued and replaced with new Route 21.	X	
88	Current Route 88 will become new Route 288A/B and will provide school trips only (2 AM & 3 PM), with service to Gunn High School, Terman Middle School, Kehillah Jewish High School, Palo Verde Elementary School, Hoover		X

[5] The VTA Draft Next Network Plan can be accessed at: http://nextnetwork.vta.org/

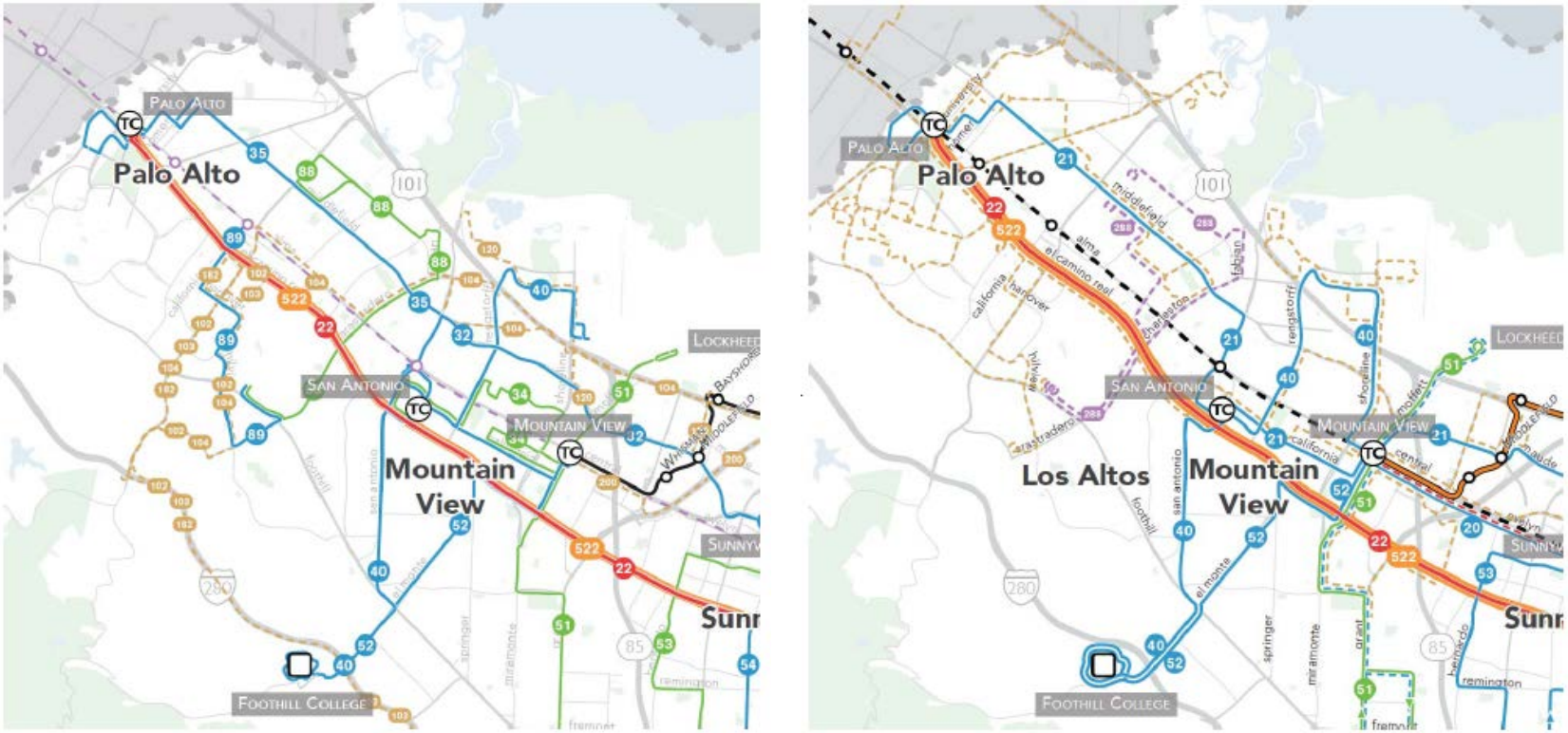
[6] This figure represents proposed changes released by VTA in January 2017. A revised Next Network is expected to be released by VTA in Spring 2017 and may include changes to the proposal for VTA service in Palo Alto. Any changes will be reflected in a new iteration of this plan.

	Elementary School, Jane Lathrop Stanford Middle School.		
89	Current Route 89 will be discontinued due to low ridership.[7]	X	
102/103/104/182[8]	No changes proposed. Limited run commute-only route. Subject to change pending outcome of upcoming study.	X	
288	New Route 288 proposed to provide service to schools in lieu of proposed discontinuation of current Route 88.	X	
522	Route will remain with increased frequency proposed to begin in April 2017.		X

[7] VTA Route 89 was slated for discontinuation in the January 2017 proposal. However, through subsequent conversations with VTA staff, Route 89 is expected to be retained in future proposals.

[8] Route 104 will serve Milpitas BART station upon opening.

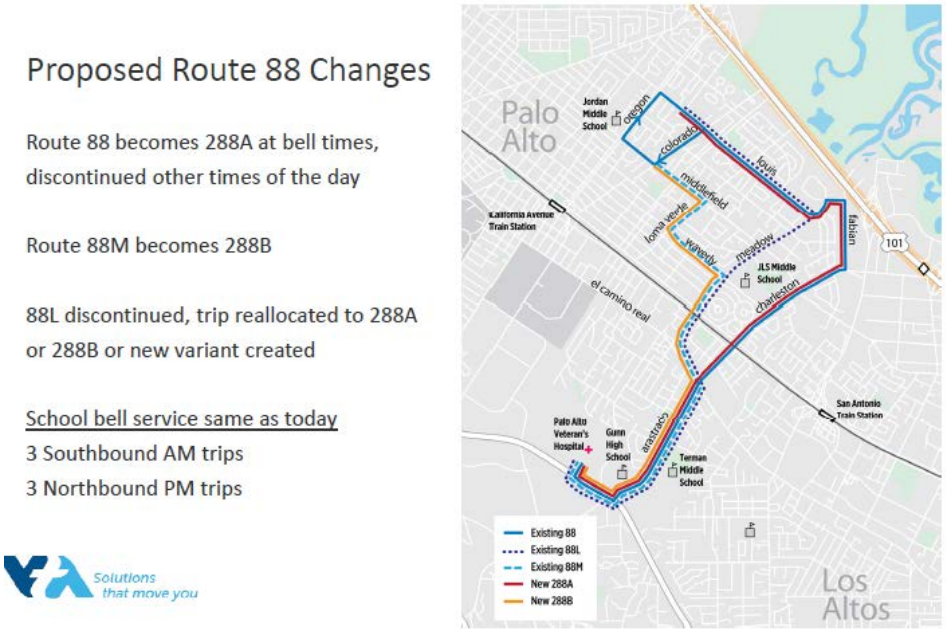
Figure 10 Current VTA Network Coverage (left) and Proposed VTA Network Coverage (right) in Palo Alto



Palo Alto will retain the following service from VTA:

- Three all-day routes, primarily along Middlefield Road (new Route 21) and El Camino Real (current Routes 22 and 522 Rapid)
- Two school tripper routes (288A and 288B) with service between portions of Palo Verde, Charleston Meadow, Greenmeadow, Fairmeadow, and Saint Claire Gardens neighborhoods and Gunn High School and others surrounding schools via Charleston and Arastradero Road
- Four express routes with limited trips during commute hours, primarily serving Page Mill Road business complexes, including current Routes 102, 103, 104, and 182

Figure 11 Proposed Route 88 Changes



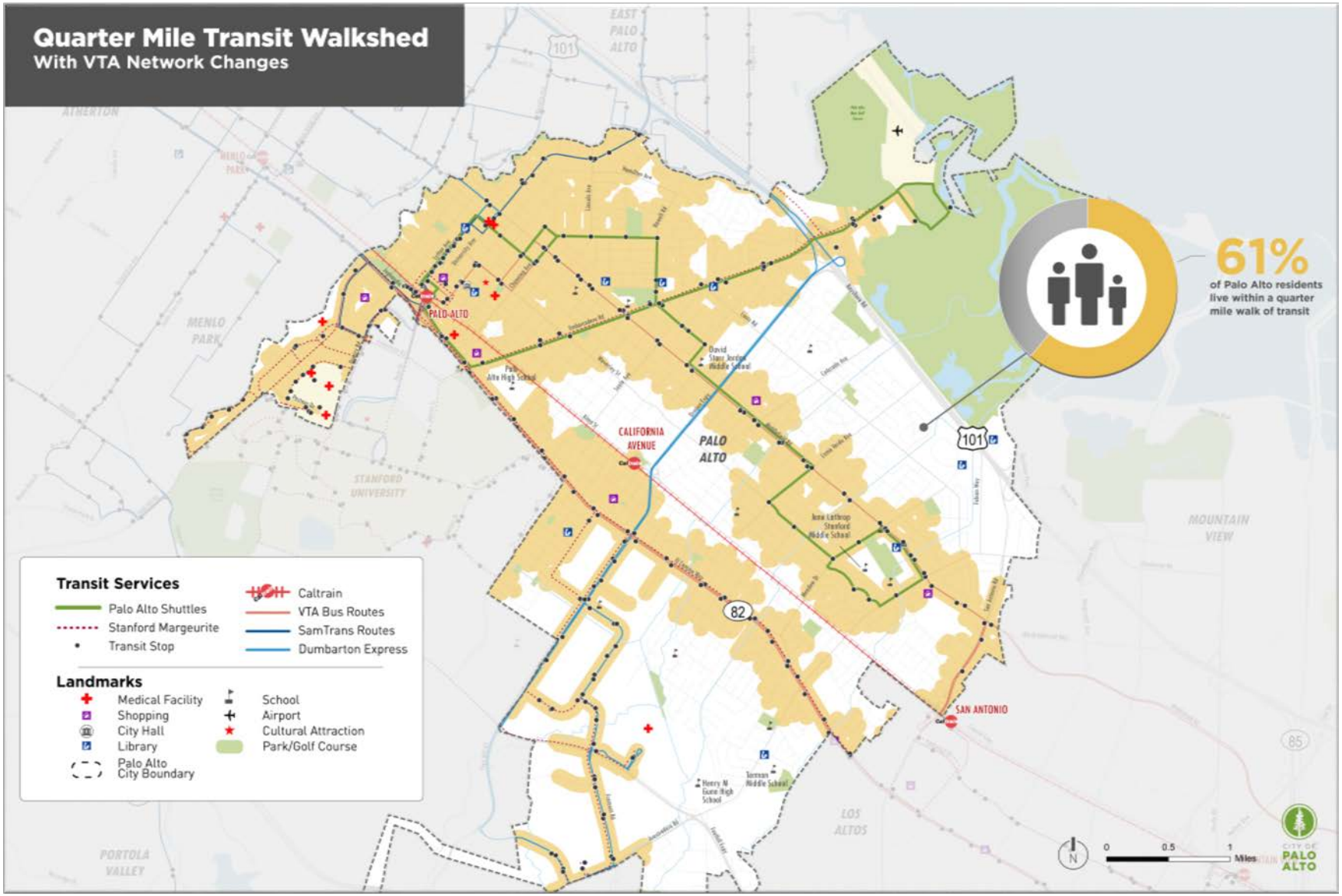
TRANSIT ACCESS WITH VTA NEXT NETWORK

The existing access to transit analysis revealed that with the current VTA network and Palo Alto shuttle routes, 74% of Palo Alto residents are within a quarter-mile walk of bus service or a half-mile walk of rail (i.e. Caltrain). This walkshed map and associated discussion is presented in Chapter 3. However, when the walkshed analysis is re-run with the Draft VTA Next Network, transit access within the same walking radius described above drops to 61% of residents in Palo Alto. This amounts to a 17.5% decrease in transit accessibility citywide.

As shown in Figure 12 below, residents and businesses in the following areas will have significantly reduced VTA service due to elimination of current Routes 88 and 89:

- Adjacent to Louis Road, Meadow Drive and Charleston Road in Palo Verde, Fairmeadow, Meadow Park and Charleston Gardens neighborhoods
- Evergreen Park and Green Acres neighborhoods and adjacent to Page Mill Road, Hoover Street, Arastradero Road and Foothill Expressway

Figure 12 Transit Accessibility Walkshed Incorporating VTA Network Changes



5 PALO ALTO TRANSIT VISION

Goals

The following goals were developed based on current operating characteristics, community priorities, and the markets for transit services. The objectives to support each goal are, in most cases, actions that can be taken by the City to help move toward realization of these goals. The service concepts and preferred service alternative presented in the succeeding chapters seek to meet these goals and objectives with service design.

- **Convenient & Accessible** – With all transit trips beginning or ending with a walk trip, all residents and businesses should be within a reasonable walking distance of a transit stop along a route providing frequent, all day service.
  - Locate routes within ¼ mile walk of major health, recreational, education, employment, cultural and social services facilities.
  - Once the first accessibility objective is met, increase citywide coverage by providing all residents accessibility to routes within a ¼ mile walk, starting first at higher density locations (e.g. multi-family housing)
- **Frequent & Reliable** – All transit routes and services within the City should provide frequent and reliable all day service in order to serve the wide variety of trip types that compose overall travel need.
  - Achieve headway benchmarks defined as 10-15 minute weekday peak, 30 minute midday, and 30-60 min weekday evening/weekends.
  - Operate reliably by meeting on-time performance standards as agreed upon with operator.
- **Visibility and Ease of Use**
  - Implement friendly, exciting and encouraging new branding.
  - Strive for convenience - superior coverage and frequent service should go where people want to go and offer real and practical alternatives to driving.
  - The system should be easy to understand and easy to ride for all users.

Markets

"Who should the shuttle serve?" was a fundamental question explored as part of this study process. While full build-out of a fare-free citywide transit system that serves all residents, employees, and visitors to the greatest extent possible is the ultimate vision, it cannot be fully achieved without complementary policy, behavioral, and built environment changes. For example, a Palo Alto resident with full access to a private vehicle will likely drive to downtown, Town & Country Village, California Avenue, etc. for a shopping or dining trip even with accessible

shuttle service because parking is free. For a choice rider, a very low marginal cost of driving begets driving.

Thus, a fare-free citywide transit system will need to be implemented incrementally and should serve the populations and physical areas of the City with the highest transit propensity and need first. As part of the process in developing system goals and objectives, identification and prioritization of these service markets further determines how service planning decisions and incremental investments in service improvements can be made.

First, priority is given to the mobility and accessibility needs of residents, employees, and visitors who are without access to a private vehicle, who choose not to drive, or cannot drive, including seniors, students, and persons with special needs or disabilities. The following service markets are identified in descending order of need, and form the basis of the service planning efforts:

1. **Seniors** – Ensure origins and destinations are served well with frequent service and a one seat ride, provide more amenities at stops that enhance customer experience, and ensure language needs are addressed.
2. **Students** – More trips during peak hour to relieve overcrowding; better serve high and middle schools; coordinate with schools to consider schedules for alternate days off.
3. **Employees Last Mile** – Serve all major employment generators with Caltrain-based shuttles and meet all peak period commuter trains at Palo Alto and California Avenue stations or provide service at high enough frequencies that meeting specific trains is less important.
4. **Employees First Mile** – Enhance first mile connectivity for Palo Alto residents with express service from dense residential areas to Caltrain.
5. **Employees Intracity** – Ensure that Palo Alto residents who also work in Palo Alto can access their place of employment car-free.
6. **Residents** – Focus on evening and weekend trip making to entertainment, dining and shopping (note: this is the hardest group to serve without complementary policy changes, such as introduction of parking charges to disincentivize auto use).

Community Outreach / Feedback

The goals, concepts, and recommendations included in this service plan were informed by an engagement process comprised of a community survey, a set of community meetings, other informal public engagement activities including social media interactions, and community engagement as part of the City of Palo Alto General Plan update. The methodology and findings for these community engagement efforts are outlined further in the below sections.

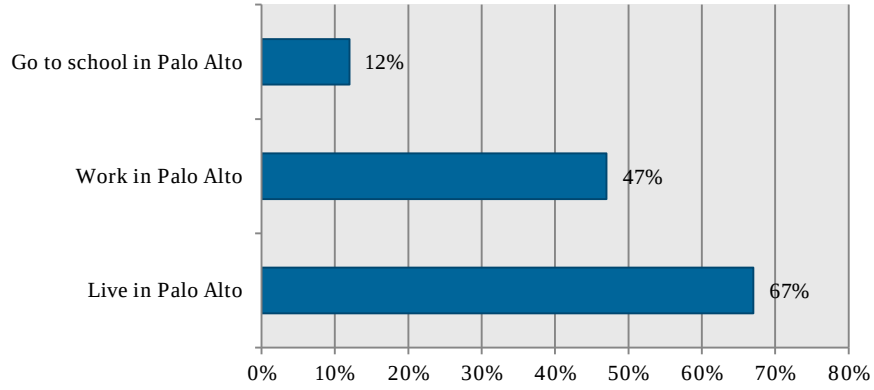
Community Survey

A comprehensive community survey was developed and distributed in the fall of 2015. Running for nearly four months from September through December 2015, the survey was housed on online survey platform SurveyMonkey. The survey was also distributed in paper form at senior centers around Palo Alto, including Avenidas and Sheridan House, to ensure the senior population had the opportunity to comment and contribute their views to the survey.

The survey garnered 1,981 responses in the nearly four-month period, representing a strong interest in the shuttle program and in making improvements to ensure the shuttle is a viable

transportation option. Of all respondents, 67% live in Palo Alto, 47% work in Palo Alto and 12% go to school in Palo Alto, indicating a mix of affiliations with Palo Alto. For visitors to Palo Alto, the most common reasons reported on the survey were for medical purposes, followed by entertainment and visiting family and friends.

Figure 13 Survey Response: What is your affiliation with Palo Alto?

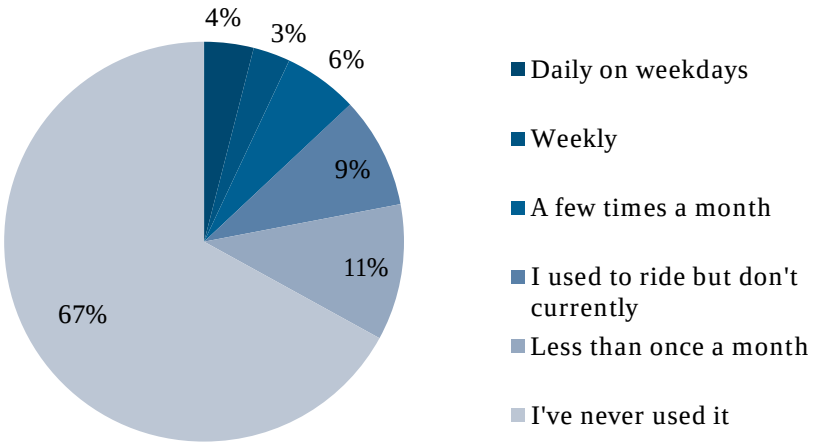


About half of respondents were members of a one or two-person household, while the other half lived with two or more people. More than half of respondents have more than one private vehicle available in their household (55%) while 11% have no car available. This alone demonstrates a challenge to encouraging widespread use of the shuttle within Palo Alto.

Shuttle Usage

Of all respondents, the vast majority (67%) said they had personally never used the shuttle (see Figure 14). However, more than 20% of respondents said that someone in their household had used the shuttle in the past three months.

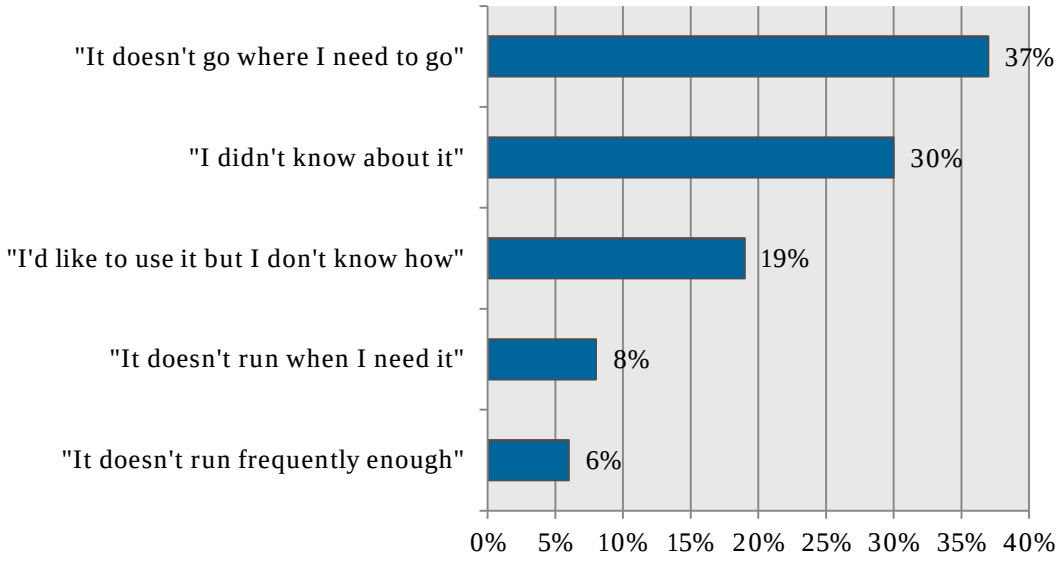
Figure 14 Survey Response: How often do you use the shuttle?



Shuttle Improvements

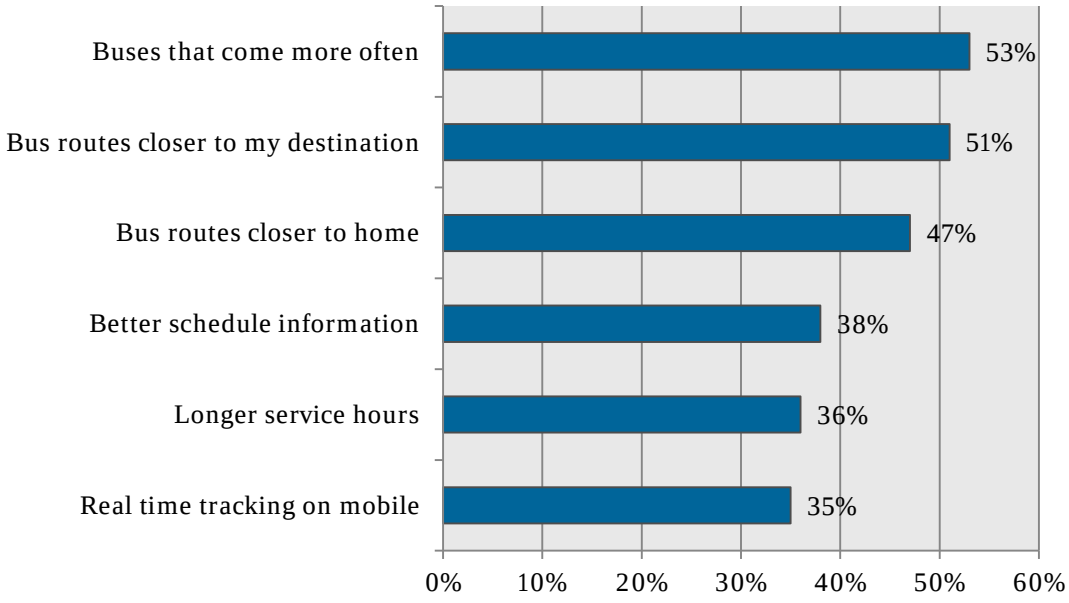
The most popular response regarding why respondents do not use the shuttle pertained to insufficient locations served by the shuttle (37%), followed by a lack of awareness of the shuttle in general or how to use it (30%) (see Figure 15).

Figure 15 Survey Response: Why don't you use the shuttle?



When asked what would entice respondents to use the shuttle more often, the most common improvements included more frequent shuttle service (53%), service to additional destinations (51%), service close to home (47%), better information on the service (38%), and longer service hours (36%) (see Figure 16).

Figure 16 Survey Response: What would motivate you to use the shuttle more often?



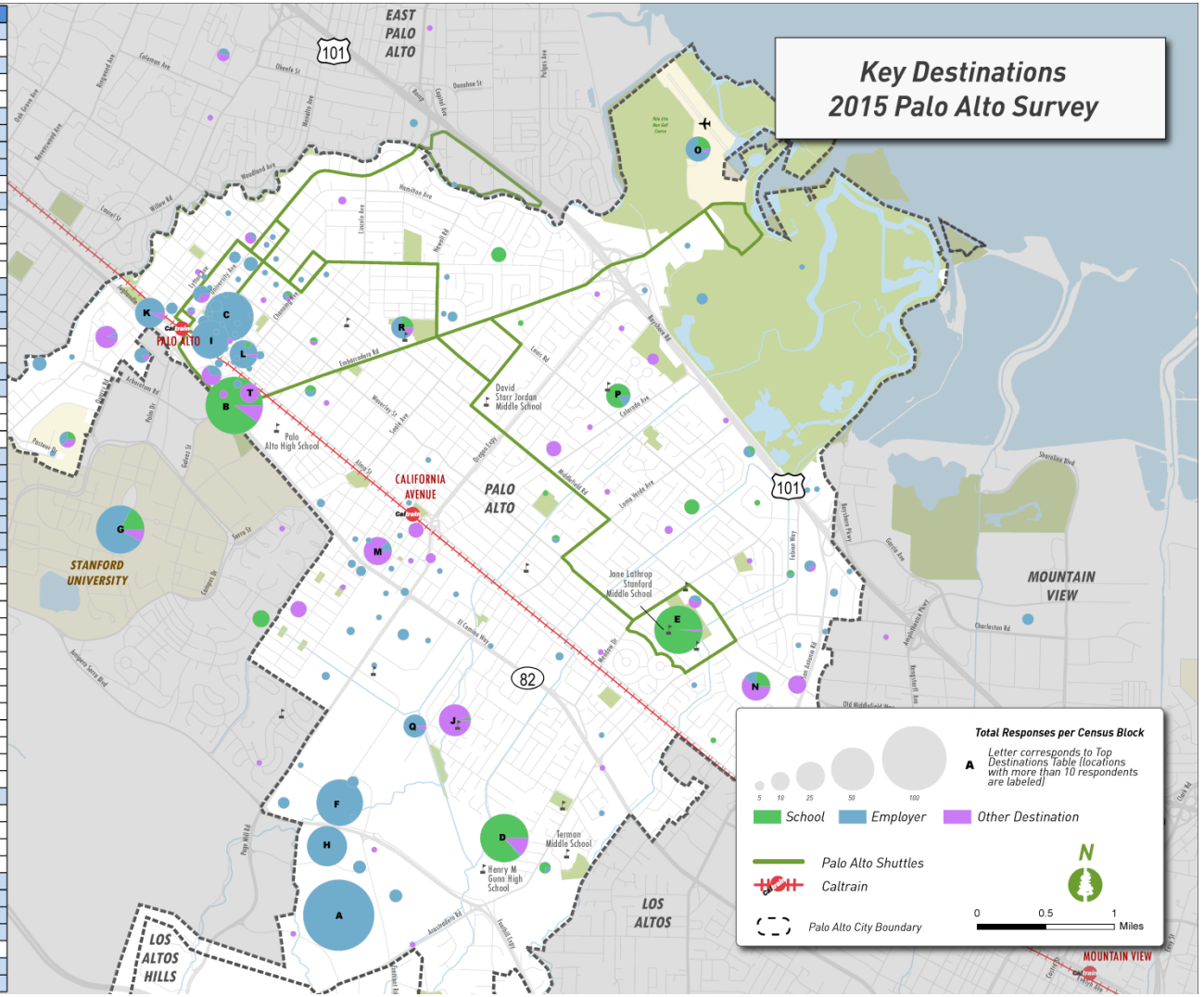
More than 1,000 pieces of destination data were collected as part of the survey. With this data, a map of "key destinations" was produced to include the work, school and other destinations, such as shopping and medical appointments, of the shuttle survey respondents. While not exhaustive or assumed to be reflective of the entire Palo Alto population, the most common destinations indicated on the community survey are shown in Figure 17 and Figure 18.

Figure 17 Survey Responses: Key Destinations

Destination	Category	Number of Responses
SAP	Employer	154
City of Palo Alto	Employer	73
Jazz Pharmaceuticals	Employer	66
Stanford University	Employer	52
Palantir Technologies	Employer	42
Palo Alto High School	School/Employer	100
Gunn High School	School/Employer	69
Fairmeadows/Hoover/JLS	Schools	69
Ohlone Elementary	School/Employer	18
Barron Park	Other destination	28
California Avenue corridor	Other destination	18
Town and Country Shopping Center	Other destination	10
Stanford Shopping Center	Other destination	8
Cubberley Community Center	Other destination	6

Figure 18 Survey Responses: Key Destinations of Survey Respondents

Map Letter	Destination
A	SAP
B	Palo Alto High School
C	City of Palo Alto
D	Briones Elementary
	Gunn High School
E	Fairmeadows Elementary School
	Hoover Elementary
	JLS Middle School
	Stephenson House
F	Jazz Pharmaceuticals
G	Stanford University
H	Integral
	Palo Alto Research Center
	PARC
	Xerox
I	Palantir Technologies
	PerformanceGaines
	Philz Coffee
J	Barron Park
	Barron Park Elementary
L	165 Channing Avenue
	Watercourse Way
M	Benetech
	Cal Ave
	SpiceKit
N	Cubberley Community Center
	Friends of P.A. Library
	Greendell School
	Greenmeadow
	Palo Alto Vineyard Church
	Piazzas Shopping Center
	Preschool Family
O	Aquifi, Inc.
	Embarcadero/E Bayshore
	Embarcadero/Geng
	Essentique
	Farmers Insurance
	Federal Aviation Administration
	Fusion Academy
	HelloPrinting
	Jones Day
	Magnet Systems Inc
	Merrill Corp
	Palo Alto Airport
	Petsky prunier
P	Ohlone Elementary School
Q	800 Matadero
	Communications & Power Industries, LLC
	Lockheed Martin
	TIBCO Software, Inc.
R	Lucie Stern Center
	Junior Museum & Zoo
	Palo Alto Children's Library
	Walter Hays Elementary School
S	Addison Elementary
T	Town and Country Shopping Center
	Trader Joes



Open-Ended Comment Analysis

Additionally, more than 1,000 0pen-ended comments were received on the shuttle survey, as well as 19 comments on the City of Palo Alto Facebook page. Responses to the final survey question, which collected open-ended and general comments regarding the shuttle service, were coded and categorized into 1,307 pieces of response data. See Figure 19 for a breakdown of these comments and an overview of key themes discussed in that category of responses.

Open-ended responses related to location of shuttle service, such as requests for new service areas, as well as communication-related comments, including requests for better shuttle informational materials both paper and online, topped the list of common themes. This analysis reinforced the findings in previous survey questions that service to additional locations, as well as improved communications and frequency, are the key concerns and requests by survey-takers. The fact that school service was also a common theme in open-ended responses highlighted the important role the Palo Alto Shuttle plays, and has the opportunity to play, in school transportation.

Figure 19 Survey Comment Analysis

Category	Number of Responses	Key Themes in the Category
Location	366	New service areas, neighborhoods and destinations; general requests for additional service
Communication (COMM)	233	Better service marketing and expanded awareness; improvements to the branding and bus wraps, improved website and schedule materials; introduction of real-time tracking and an app for the service
Frequency (FREQ)	164	Requests for more frequent service (every 5-15 min) or more buses
Service hours (HRS)	137	Requests for midday hours on all shuttle routes, service hours later into the evenings (to allow for dinner out or to match the evening commute) and weekend service
School Service (SCHOOL)	105	Requests for service to additional PA schools, for shuttle schedules that link up to school schedules and related to capacity issues when school is in session and on routes serving schools
Reliability	73	Comments that the bus is frequently operating far off its published schedule which deters use of the service; requests that the shuttle better aligns with other transit in the city (Marguerite, VTA)
Caltrain	59	Better service linking to Caltrain stations and with Caltrain schedules
Amenities (AMEN)	53	Benches and signage at stops, senior accessibility such as low step boarding, pull cords on-board the shuttles, bike facilities and stroller facilities on-board
Door to Door	31	Suggestion for paratransit or door-to-door service in addition to or in lieu of the shuttle; partnerships with Uber, TNCs, etc.
Travel Time	28	Requests to reduce shuttle travel time, suggestions for express service/routes with fewer stops

Key Findings and Conclusions

Key findings from the community survey demonstrate opportunities to expand the shuttle's reach into new ridership areas and markets. Opportunity areas for improvements should facilitate mobility for:

- Seniors — through ADA accessibility, helpful drivers, and service to senior centers and shopping centers
- Students — parents request reliable, timed links to schools with enough capacity
- Caltrain commuters — timed and reliable service to/from Caltrain stations, particularly Palo Alto station where bullet trains stop and during hours which allow for use in the evening commute
- Employees at Palo Alto businesses — opportunity to provide first mile/last mile service to employers along Page Mill Road and one-seat ride to people who work at Stanford and in downtown business corridors
- Travelers during more hours of the day — opportunities for travel during the midday, evenings and on weekends was requested
- Residents of more neighborhoods — such as the Southwest part of Palo Alto, including Ventura, Barron Park and Evergreen Park neighborhoods, among other areas
- Everyone — a robust communications and awareness campaigns, as well as efforts to improve the usability of the website and other informational materials, would benefit all current and potential future users of the shuttle.

Community Meetings

Two community meetings were held on March 10, 2016 to share an overview of the findings of the community survey and discuss five initial shuttle service concepts, which included three new routes and two modifications or extensions to existing shuttle routes. Attendees were notified that all potential new shuttle routes are currently unfunded.

An afternoon meeting was held at the Palo Alto Main Library to ensure the senior population and others were able to come to the meeting via the existing Crosstown shuttle service. The evening meeting was held at the Lucie Stern Community Center to allow those who work normal business hours to attend.

The afternoon meeting was attended by about 40 people and the evening meeting by about 20. The afternoon meeting was particularly well-attended by residents of the Moldaw Residences. Overall, attendees were happy with the proposal to expand the shuttle routes and about the locations served by the proposed new and modified routes. Depending on the specific home locations and destinations of attendees, participants expressed interest and approval of different routes.

Comments received at the meetings included requests to:

- Ensure safe boarding and waiting areas at all stops for new routes, including benches, closest to senior centers and other destinations
- Extend hours on Crosstown route to evenings and weekends
- Improve frequency on all routes
- Serve Palo Alto Caltrain station on both sides of station
- Strive for easy transfer opportunities between Palo Alto shuttle routes and other transit services
- Consider extending Barron Park and/or Southwest routes to Mitchell Park and to intersect with the Crosstown route
- Serve additional key destinations including the JCC, Palo Alto Medical Foundation,
- Update current bus branding and decorations to represent all rider groups; install cords on the buses to indicate when riders want to exit the bus
- Consider the impacts of the shuttle expansion and downtown parking pricing on nearby residential neighborhoods
- Ensure shuttles are always ADA accessible for those in wheelchairs and scooters
- Consider whether a quarter-mile walkshed is realistic for seniors and people with disabilities
- Consider travel time on new and existing routes – does it take too long to be worth it?
- Advertise the Shuttle in the Weekly newspaper, include in transit planning apps
- Impact of reduced Stanford Marguerite service during the summer months
- Consider how a potential flex, on-demand service could work for seniors or low income residents without smart phones
- Each of these comments either reinforced the need for a certain goal or improvement already in discussion for future implementation or was regarded as an important consideration for future steps of this work. The latter type of comment includes those related to choosing specific stop locations, building in transfer opportunities, and development of a branding and communications campaign.

Other Engagement Activities

Targeted in-person engagement was conducted at senior residence and activity centers in Palo Alto in December 2015 in conjunction with the survey. In addition to bringing more responses to the survey, this effort offered the opportunity to engage with potential and current shuttle users in person. Additional comments were fielded through social media including on the City of Palo Alto Facebook page. These comments were incorporated into the survey analysis described earlier in this chapter.

- Relevant comments from the ongoing community involvement process for Our Palo Alto 2030, including a Summit in May 2015 with more than 350 participants, were reviewed and considered in development of shuttle plans. Notes from the summit include multiple calls for improvements to the existing shuttle services, including[9]:

[9] http://www.paloaltocompplan.org/wp-content/uploads/2015/06/Palo_Alto-Summit_Q4_results.pdf

- "Expand Palo Alto Shuttle geographically and in frequency (i.e. West of El Camino)."
- "Improved citywide shuttle service with collaboration with local employers."
- "More geographically distributed bus/shuttle service – within a 10 min walk of each home."
- Enact shuttle improvements to routes and schedules to meet the needs of both commuters and residents; expand into neighborhoods
- Improve communication of services via websites, apps, signage
- On-demand shuttles

PROPOSED ROUTE MODIFICATIONS

Based on current transit coverage in Palo Alto and gaps in coverage identified through the transit walkshed analysis, proposed changes to the VTA network, and community needs as expressed through the outreach process, a full set of route concepts were developed and screened as part of the visioning process. See Appendix B for full list of initial concepts and the screening process methodology. What is shown below is the outcome of the visioning and screening process: proposed route modifications to Crosstown and Embarcadero routes, as well as a new Palo Alto Shuttle route, "South Palo Alto." Additional variants not shown in this chapter were considered by staff and can be found in Appendix C. These proposals seek to achieve enhanced coverage, frequency, and span within the Palo Alto Shuttle network while addressing the reduction in VTA service included as part of the Draft Next Network Plan.

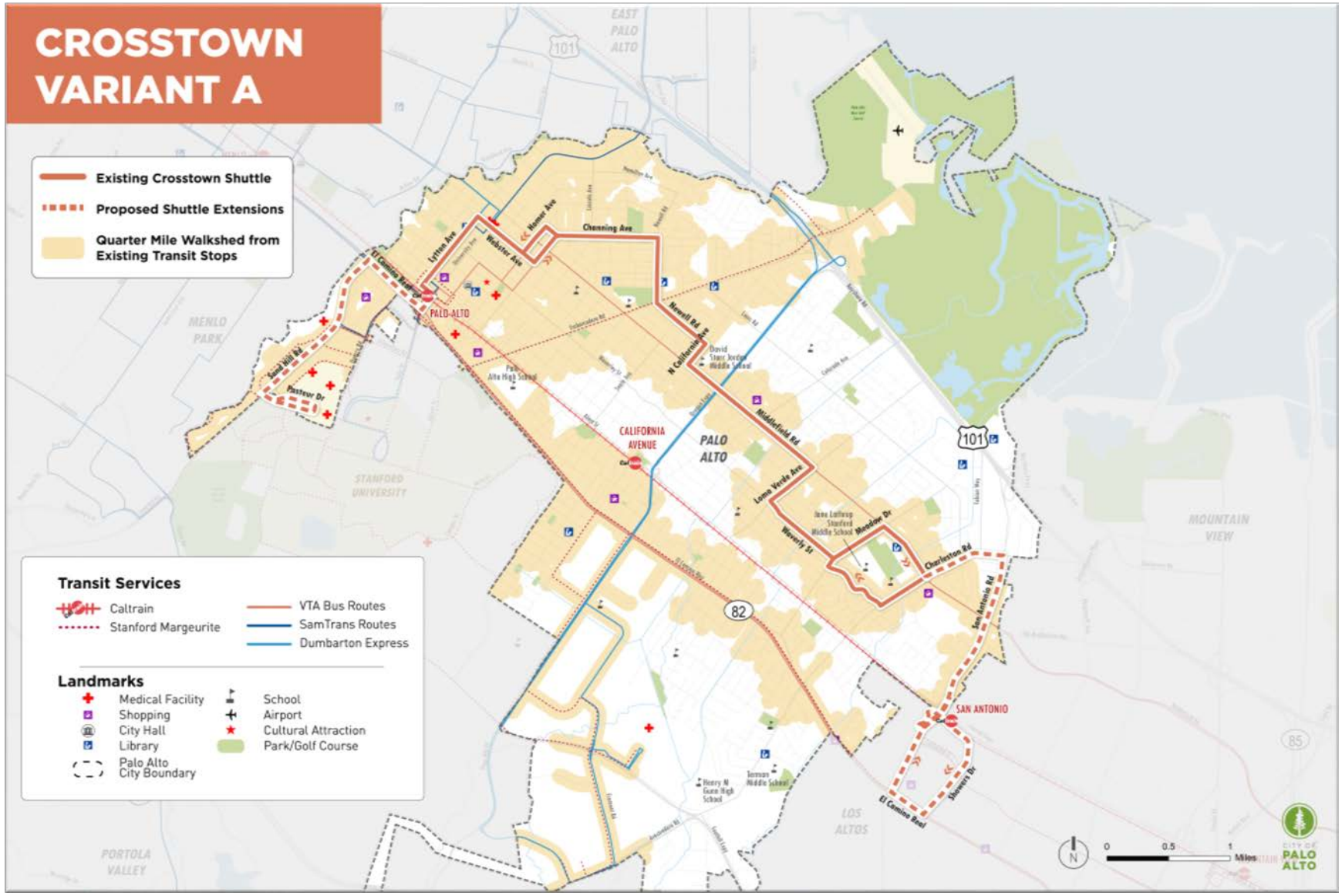
Crosstown

Two variants for a revised Crosstown shuttle route are presented and are still under consideration by the City. **Crosstown Variant A** improves upon the original Crosstown route by adding new routing on both ends:

- North End - Extension from Palo Alto Caltrain Station to the Stanford Shopping Center and Stanford Medical Center
- South End – Extension from Middlefield Road to San Antonio Road and El Camino Real. This extension adds access to the Moldaw Residences, as well as San Antonio Caltrain and San Antonio Shopping Center.

Crosstown Variant A Specifications	
Primary Route Type	Community Circulator
Round-Trip Route Length	20.2 miles
Round-Trip Cycle Time	105 minutes
Vehicle Requirements	7 vehicles for 15-minute service 4 vehicles for 30-minute service 3 vehicles for 40-minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Stanford Medical Center* Stanford Shopping Center* Palo Alto Caltrain* Downtown Palo Alto* Lytton Gardens Rinconada library Jordan Middle School Midtown JLS Middle School / Hoover Elementary / Fairmeadow Elementary* Mitchell Park and Library* Cubberley Community Center* Senior residences/centers* San Antonio Caltrain San Antonio Shopping Center*

Figure 20 Crosstown Route Variant A

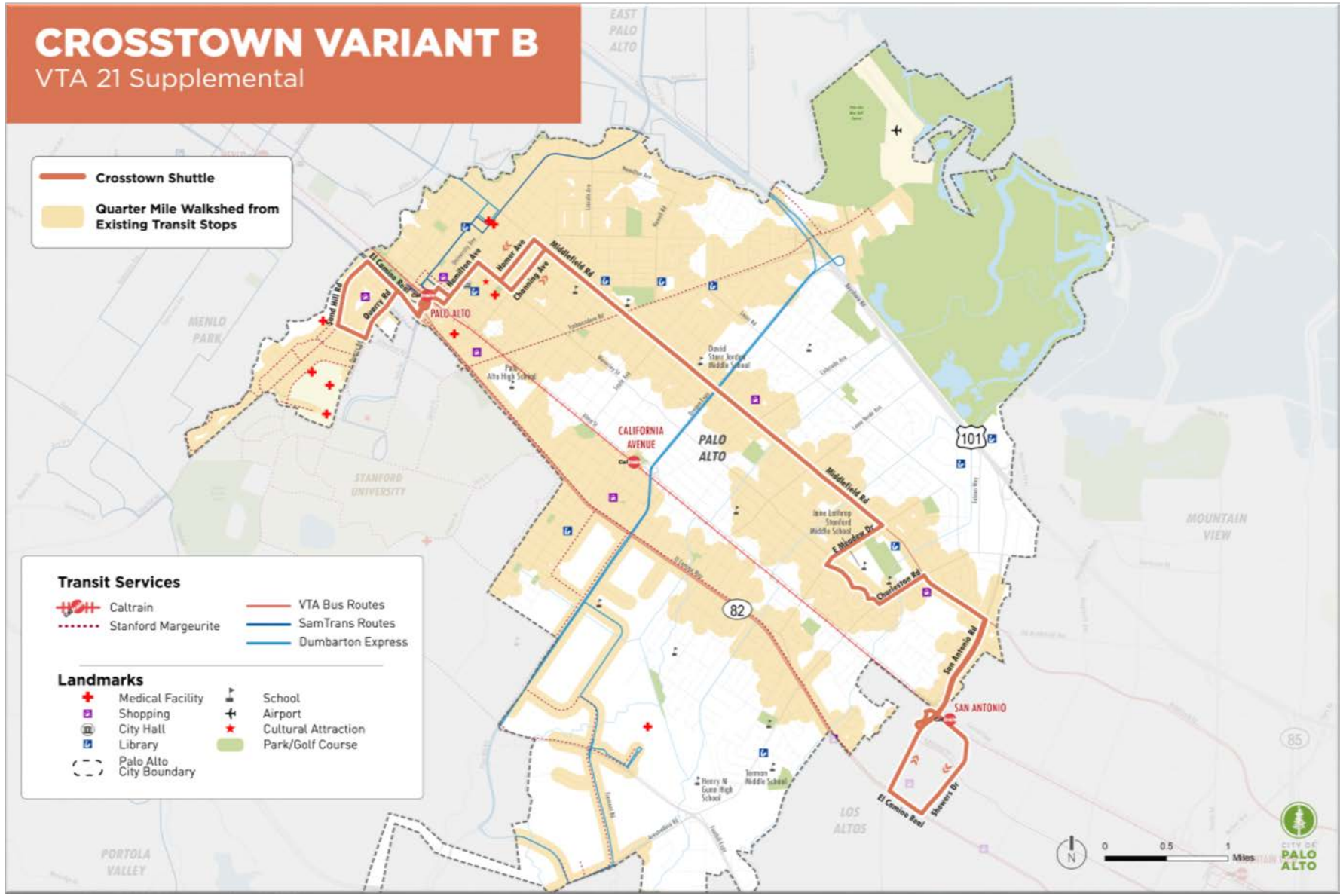


Crosstown Variant B provides coverage redundancy for the new VTA Route 21 in an effort to offer increased frequency, up to 15-minute headway.

Crosstown Variant B Specifications	
Primary Route Type	Community Circulator
Round-Trip Route Length	15.7 miles
Round-Trip Cycle Time	90 minutes
Vehicle Requirements	3 vehicles for 30-minute service 2 vehicles for 45-minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Stanford Medical Center* Stanford Shopping Center* Palo Alto Caltrain* Downtown Palo Alto* Lytton Gardens Rinconada library Jordan Middle School Midtown JLS Middle / Hoover Elementary / Fairmeadow Elementary* Mitchell Park and Library* Cubberley Community Center* Senior residences/centers* San Antonio Caltrain San Antonio Shopping Center*

As part of the concept service plan, Crosstown is targeted for significant increases in frequency and service span. Initially, peak weekday frequencies would be improved and span of service extended to provide additional utility in the early AM and evening periods. Over time, service frequencies would be improved to 15 minutes during peak periods and service would be introduced on weekends.

Figure 21 Crosstown Route Modification – Variant B



Embarcadero

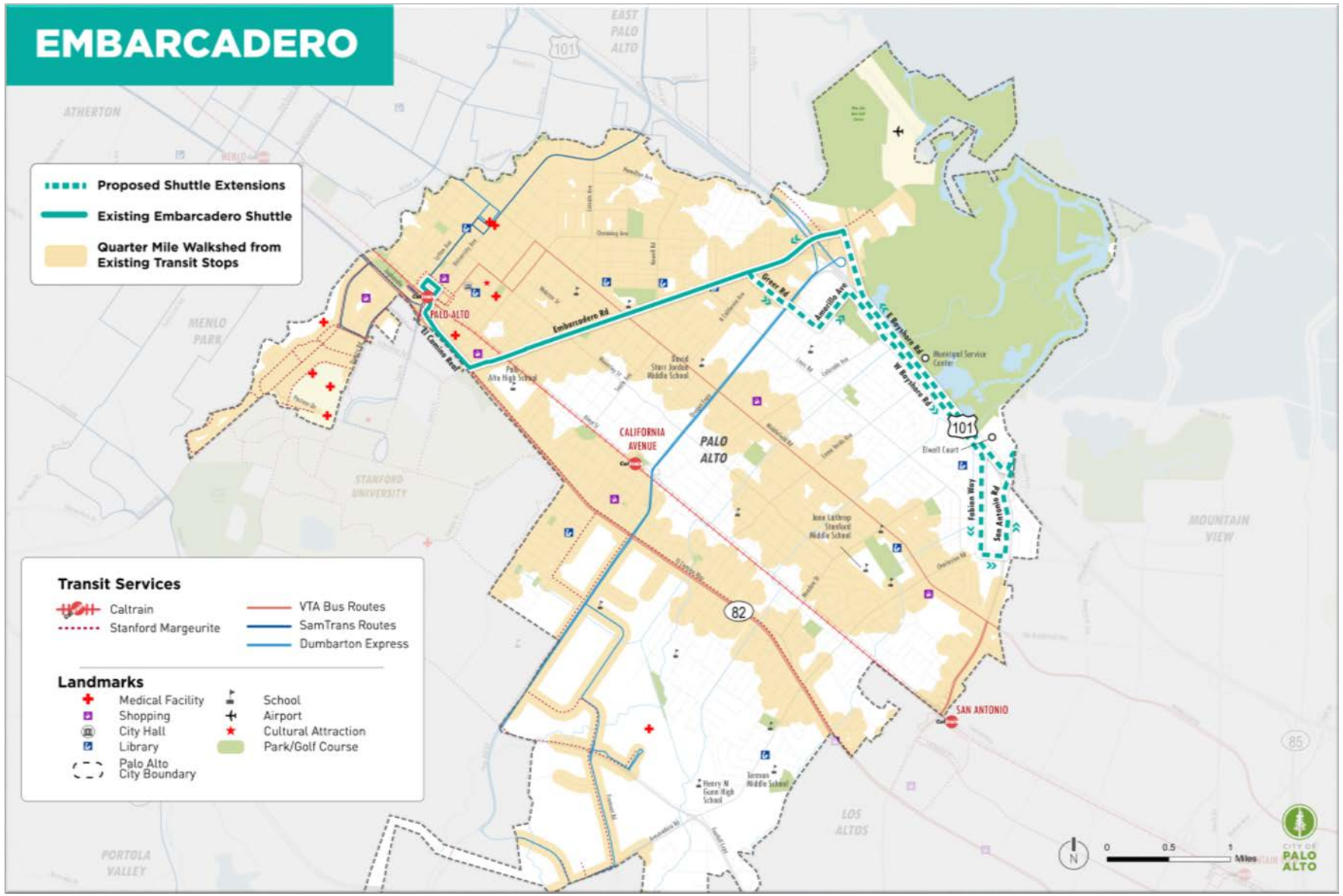
As a first/last mile shuttle, the current route structure is designed to serve the Palo Tech Center employers east of US 101. A modification of the Embarcadero route is presented with the goal of addressing coverage gaps presented in the Greer Park/Midtown areas with the elimination of VTA routes and expanding Palo Alto Shuttle coverage to areas along both East and West Bayshore. With match funding ending and a duplicate service to the Palo Tech Center provided by the Stanford Marguerite Tech route, the modified **Embarcadero** presented here extends the current Embarcadero route to serve municipal service buildings and other businesses along West and East Bayshore Drives, as well as the portion of San Antonio Road nearest to U.S. 101.

Embarcadero Modified Route Specifications	
Primary Route Type	First/Last Mile and Community Circulator
Round-Trip Route Length	10.8 miles
Round-Trip Cycle Time	50 minutes
Vehicle Requirements	4 vehicles for 15-minute service 2 vehicles for 30-minute service 2 vehicles for 60 minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Palo Alto Caltrain* Downtown Palo Alto* Town & Country Village* Paly High School* Lytton Gardens Rinconada library Palo Alto Municipal Service Center[10] Palo Alto Animal Services Businesses near San Antonio Road/E Charleston Road Senior residences/centers* Greer Park

Staff considered additional variants on the Embarcadero route, which can be viewed in Appendix C.

[10] Expanding the Palo Alto Shuttle to the Municipal Service Center allows the City of Palo Alto to expand its employee Caltrain GoPass program to employees outside of the City Hall.

Figure 22 Embarcadero Route Modification



South Palo Alto

Most routes, whether Palo Alto Shuttle or operated by other agencies, serve downtown Palo Alto, including the Palo Alto Transit Center. **South Palo Alto** terminates at the VA hospital and the California Ave Caltrain Center, serving schools and other destinations along Arastradero, Charleston, Louis, and Colorado along the way. This South Palo Alto route concept provides connections to Caltrain by terminating near the California Avenue Caltrain station. Variant A also includes a Paly school tripper extension serving the residential areas south of Oregon Expressway.

South Palo Alto Specifications	
Route Type	Community Circulator
Round-Trip Route Length	13.4 miles
Round-Trip Cycle Time	75 minutes (60 minutes evening/weekend)
Vehicles Requirement	5 vehicles for 15-minute service 3 vehicles for 30-minute service 1 vehicle for 40-60 minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	California Avenue* California Avenue Caltrain* Midtown Palo Verde neighborhood Mitchell Park and Library* Senior residences/centers* Terman Middle School* Gunn High School* VA Hospital

Two additional variants on the South Palo Alto route were considered by staff and can be viewed in Appendix C.

Figure 23 South Palo Alto

SERVICE PLAN AND IMPLEMENTATION

Annual service hours and costs are presented for each route (including two variants for the Crosstown route) in Figure 24. For each route/variant, a description and estimated annual costs are provided for both an enhanced (initial) service level and a full (meets frequent and reliable goal) service level. The City of Palo Alto may select a phased introduction of new or modified shuttle routes, or may choose to introduce a full service level from the beginning, acknowledging the loss of VTA service.

Figure 24 Service Implementation Summary

	Enhanced Service Level			Full Service Level		
Route Name	Description of Service	Annual Service Hours	Annual Cost[11]	Description of Service	Annual Service Hours	Annual Cost
Crosstown						
– Variant A	7 AM to 7 PM weekday service; 30-minute frequency all day, 40 minute in evenings, no weekend service	11,985	$864,118	7 AM to 9 PM weekday service; 15-minute peak frequency, 30-minute midday and 40-minute evening; 8 AM to 8 PM weekend service with 40-minute frequency	21,705	$1,564,930
– Variant B[12]	6 AM to 10 PM weekday service with 30-minute frequency all day; 8 AM to 8 PM weekend service with 45-minute frequency	14,640	$1,055,544	6 AM to 10 PM weekday service with 30-minute frequency all day; 8 AM to 8 PM weekend service with 45-minute frequency[13]	14,640	$1,055,544
Embarcadero	6:50 AM to 7 PM weekday service with 20-minute frequency during peak, no midday service, 40-minute evening; no weekend service	5,228	$376,902	7 AM to 9 PM weekday service with 15-minute frequency in peak, 30-minute frequency in midday and evening; 8 AM to 8 PM service on weekends with 60-minute frequency	11,400	$821,940

[11] Assumes service hour cost of $72.10.

[12] Crosstown Variant B duplicates much of VTA Route 21's route. 30-minute service on Crosstown Variant B would be scheduled as to offer 15-minute frequency to passengers when combined with VTA Route 21's 30-minute service.

[13] Based on proposed service specifications on VTA Route 21.

South Palo Alto (To be coordinated with VTA Routes 288 and 89)	7 AM to 7 PM weekday service with 30-minute frequency all day and 60-minute evening frequency; no weekend service	8,670	$625,107	7 AM to 9 PM weekday service with 15-minute frequency in peak, 30-minute midday, 60-minute evening; 8 AM to 8 PM weekend service with 60-minute frequency	14,240	$1,026,704

Sample Route Package

A sample route package incorporating Crosstown Route Variant A, the modified Embarcadero Route, and South Palo Alto Variant A has been produced in Figure 25. This comparison shows the operating cost differences between the annual operating costs of the existing shuttle network and both an initial and full service implementation of this sample package.

Figure 25 Sample Route Package and Associated Operating Costs

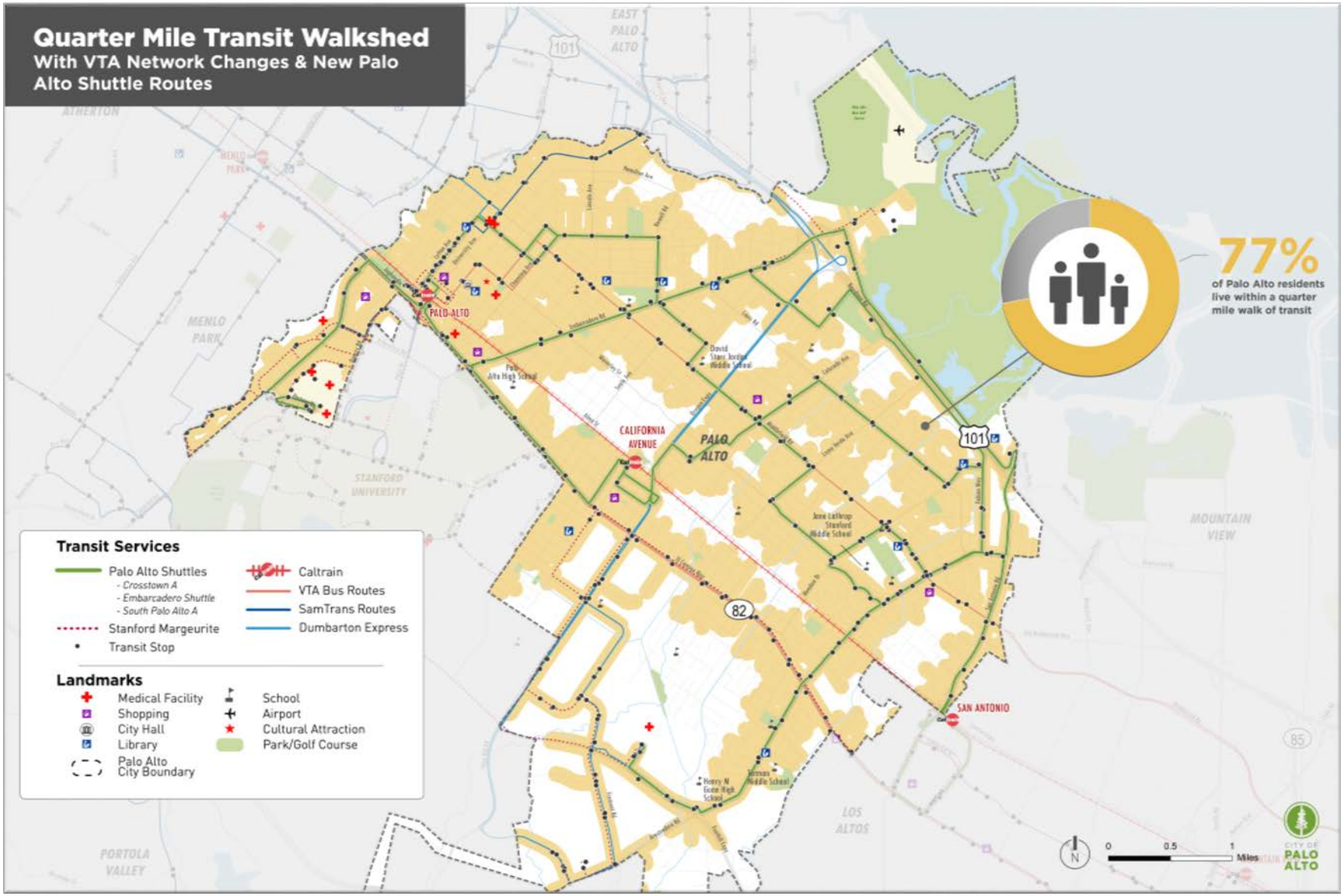
Route and Variant	Current Annual Operating Costs	Annual Costs – Enhanced Service Level	Annual Costs – Full Service Level
Crosstown A	$281,911	$864,119	$1,564,931
Embarcadero	$252,400	$376,903	$821,940
South Palo Alto	--	$625,107	$1,026,704
TOTAL	$534,311	$1,866,129	$3,413,575

Note: The Embarcadero shuttle is funded in partnership with the Joint Powers Board (JPB). The JPB currently pays 46.5% of the operating cost (up to $117,300 per year). The breakdown of current operating costs is $135,100 per year from the City of Palo Alto and $117,300 from the JPB per year.

As the above table shows, the investment in an expanded shuttle system will require significantly more funding on an annual basis; however, with the elimination of multiple existing VTA routes, expansion of the Palo Alto Shuttle system is important to maintaining strong transit coverage and access for Palo Alto residents and visitors.

As shown in Figure 26, this sample package results in transit access for 77% of Palo Alto residents within a quarter-mile walk of a bus stop or half-mile walk of a train station. This is an increase from the 61% identified when incorporating the loss of the VTA routes proposed in the draft Next Network (Figure 12). It also represents an improvement in transit access from the 74% of residents who are currently within a quarter mile of bus transit with the existing transit service (Figure 8).

Figure 26 Transit Access Walkshed Analysis – Sample Route Package



Capital Improvements

Because Palo Alto contracts operation of its shuttle routes to a private transportation provider (currently MV Transportation), it does not own buses or maintenance facilities, and thus primary capital needs are bus stop improvements and ongoing design and printing of new informational materials and schedules. The following section outlines guidelines and costs for bus stops and amenities. Follow on service planning will determine stop locations for new or modified routes, as well as any upgrades needed to existing stop locations.

Bus Stops

Stop siting/placement will be part of detailed route planning for modified or new routes. All stops should be fully accessible with a concrete landing and access to a sidewalk or pathway. ADA accessibility standards require that each bus stop include a landing pad with a minimum width of 60 inches and minimum depth of 96 inches. Bus stops should also connect to adjacent sidewalks or pedestrian paths. Many systems go beyond ADA minimums and provide a landing pad for the rear door of the bus. The addition of landing pads, connecting sidewalks, and amenities such as seating and shelter enhance the customer experience and are especially important for seniors and other persons with disabilities.

Signage and Amenities

Well-designed bus stop signage has the opportunity to provide useful customer information while simultaneously marketing transit service. Route signage should be limited to one design to minimize inventory and materials costs. The unit cost of bus stop poles and signage is approximately $250 per stop.

Bus stop amenities enhance the customer experience by increasing comfort and perceived safety and reducing perceived waiting times. Bus stop amenities also influence the community's perception of transit service. The approximate cost of bus shelters with seating and trash receptacles is $10,000 per stop.

Figure 27 Bus Stop Amenity Guidelines

Amenity	Description
Pole and sign	Installed at stops with fewer than 5 average daily boardings
Pole, sign, and seating	Installed at stops with 10-20 average daily boardings and at key senior destinations
Pole, sign, seating, and shelter	Installed at stops with 20 or more average daily boardings and at schools and senior centers

The provision of amenities is typically based on ridership. Circumstances that might preclude installation of shelters or seating at particular stop meeting specific thresholds are:

- Amenities would compromise pedestrian or operational safety
- Adequate right-of-way is not available
- Regulations enforced by City, County, State, or Federal government
- Installation costs are excessive
- Plans are in place to relocate or close the stops

6 FOR FURTHER CONSIDERATION

OTHER SERVICE DELIVERY MODELS

With transportation network companies and technology applications adding new options for customers to more directly control when, where and how they travel, the City wants to explore the potential for and impacts of converting all or some of its services into real-time e-hailing flex services. There are several ways to accomplish this objective. At a high level, these include:

- Partnering with transportation network companies (TNCs) through a contract or MOU
- Developing/acquiring applications for e-hailing, dynamic trip-booking, vehicle assignment, and electronic payment functionality to apply to services operated in-house or via contract
- Converting all or some of existing fixed route to a blended flex service and apply a combination of advanced booking and real-time e-hailing, scheduling, and fare payment system functionality

The analysis of existing services coupled with the community survey results suggests the predominant improvements that would encourage potential riders to use the shuttle were corrective actions to the perceived service deficiencies concerning the desire for more frequent service, better service coverage, more information, longer service span, etc.

The perceived service gaps reinforce the City's interest in exploring whether an alternative service delivery approach might yield higher ridership. Essentially, these data suggest that potential riders want a service that operates when they wish to travel and where they wish to travel. This service delivery philosophy correlates to flexible services with real-time responsiveness (similar to OmniLink Flex-Route – a point deviation service) as well as real-time dynamically routed services (similar to the FlexBus concept and the VTA Flex pilot).

Flex Service Types

Partnering with a TNC – one obvious service model for the City to consider is partnering with Transportation Network Companies like Uber and Lyft. TNC's offer an easy bridge to extend existing services to currently unserved and underserved areas and markets via a memorandum of understanding, service parameters and standards, and a financial agreement. Figure 28 presents a snapshot of pros and cons of the TNC partnership model.

Figure 28 TNC partnership Model Pros and Cons

TNC Partnership	Pros	Cons
Start-up process	Easy to set up; Quickly expands mobility to a wide market	MOU must address legal, financial, risk, performance considerations

Financial	Low initial investment; Reasonable investment for modest expansion of mobility	Subsidy on a per trip basis, unless there is a counteracting requirement for a high level of shared trips, will increase overall costs, especially at a cost/trip basis
Access to Service	Quickly expands to cover the general public TNC market	Requires concerted effort to facilitate access to service and service accessibility to low income, and disabled population
Managing Service	The customer arranges transport directly with the TNC	The City has limited control over service quality and the amount of service provided which can have fiscal impacts

E-hailing Flex Services – The City may also consider converting the shuttles to point deviation and/or anchored flex services and deploying e-hailing and electronic fare payment applications. Figure 29 presents a snapshot of pros and cons of the point deviation and anchored flex service models.

- *Point deviation Flex services* include a generalized transit route created by a series of designated stop locations with the ability of the service to deviate between stops on request to make off-route pick-up and drop-offs.
- *Anchored Flex services* operate more like dial-a ride without specified routes and stops except for one, in some cases 2-3, where the vehicle is always scheduled to be at a particular location and time, generally each hour of half hour. At the anchor stop, the vehicle connects with a regional rail or transit service. Otherwise, the anchored flex service is free to pick up and drop off passengers based on requests.

Figure 29 Point Deviation/Anchored Flex Service Model Pros and Cons

Point Deviation / Anchored Flex Services	Pros	Cons
Start-up process	Modify existing services into point deviation and/or anchored Flex services can be done with a service change	Requires customer awareness; Retrain drivers; Acquire and deploy technology systems
Financial	Point deviation productivity can be high; Improved service cost-effectiveness	Requires initial investment in technology; Technology deployment takes time;
Access to Service	Improved customer awareness, service access, service information; Increase ridership	Point deviation and anchored dial-a-ride services can be a challenge to some customers
Managing Service	Technology applications will enhance customer experience, operations management, data collection, reporting	The City is responsible for operations, service quality

Dynamic Point-to-Point Flex Services – The next option for the City to consider is a real-time dynamically routed point-to-point Flex service. This is essentially a service without routes or schedules. This service model was initially designed for Central Florida as the FlexBus concept and is currently being implemented on the LYNX NeighborLink service in a slightly modified zonal service model. VTA Flex service in Milpitas is another example. Figure 30 presents a snapshot of pros and cons of the point deviation and anchored flex service models.

Figure 30 Dynamically Routed Flex Service Model Pros and Cons

Dynamically Routed Flex Services	Pros	Cons
Start-up process	Modify existing services; Rebrand existing services; Leverage ridership base	Retrain customers and drivers; Acquire and deploy technology; More vehicles
Financial	Productivity can be high; High cost-effectiveness; Low subsidy per trip	Requires initial investment in technology; Technology deployment takes time;
Access to Service	High customer awareness & service access, Real-time service; Real-time status	Service concept needs to be explained; Non-tech savvy and certain populations may require support
Managing Service	Enhanced customer service, operations management, data and reporting	The City is responsible for operations, service quality

Next Steps

Based on this brief analysis of a range of Flex service models currently operating and/or emerging in the industry, there seems to be evidence for the City to further investigate new and emerging service delivery models such as TNC-partnerships, dynamic Flex service models, and point deviation service models as a replacement for or in addition to local fixed-route circulator service. The intent of these service delivery types is to offer new ways to deliver mobility in lower-density and lower-productivity environments. Their primary advantage is in providing more cost-effective service that can minimize the tradeoff between frequent service and good coverage through partnerships or deviations.

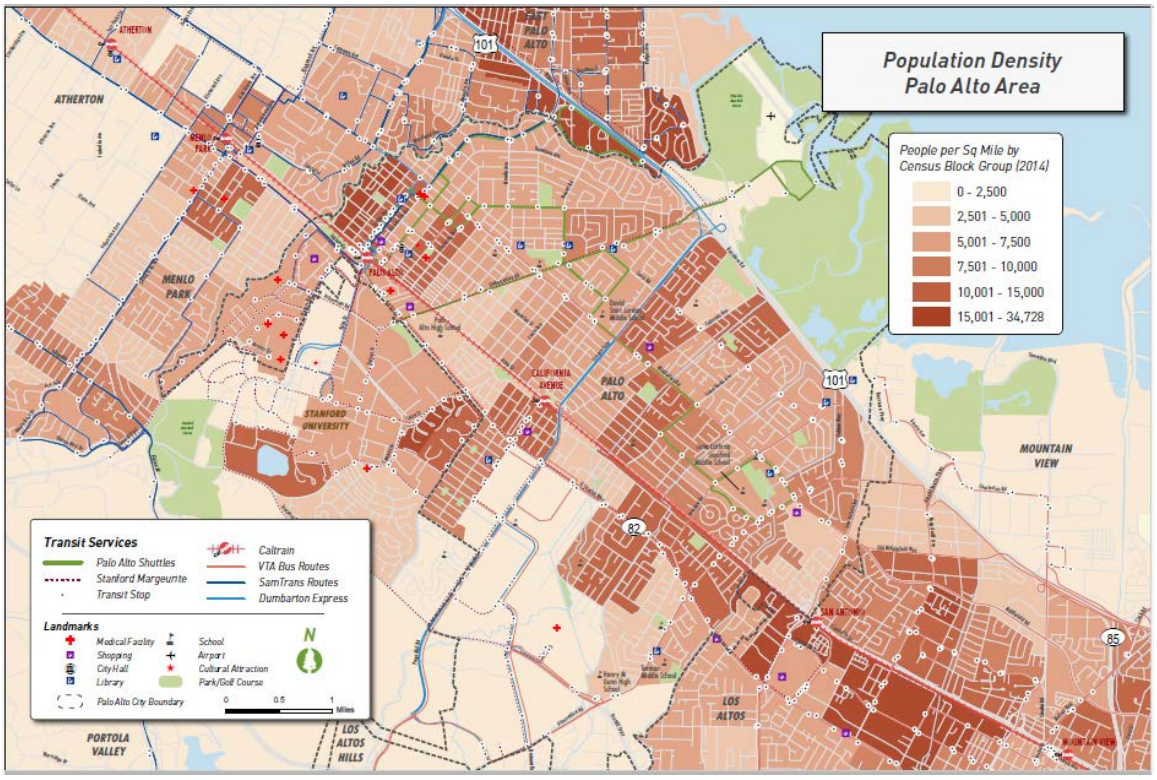
This initial assessment just scratches at the surface of what alternate service delivery could look like in Palo Alto. A detailed planning and implementation study should follow to further develop and refine these concepts into a feasible pilot program. At time of writing, several formal partnerships have formed and are currently being piloted here in the Bay Area, and best practices/lessons learned from these programs provide a logical, convenient, and accessible starting point for the City as it seeks to explore emerging mobility options for its residents, employees, and visitors.

APPENDIX A COMMUNITY PROFILE

The City of Palo Alto is located about 30 miles south of San Francisco and 20 miles north of San Jose in Santa Clara County, California. Palo Alto maintained a relatively stable population from 1970 to 2000 with 4.7% growth but has been growing significantly faster since 2000. The 2010 US Census found a population of about 64,000 residents. However, the city's population is projected to increase 25.1% between 2000 and 2030, reaching more than 73,000 residents by the year 2030.[14]

Figure 31 shows the density of residential population throughout Palo Alto. The highest density areas include the University Avenue and California Avenue areas, as well as Barron Park and some census tracts east of Middlefield and south of Oregon Expressway. Other areas of relative high density are in East Palo Alto and near the San Antonio Caltrain station on the border with Mountain View.

Figure 31 Population Density in Palo Alto



[14] Our Palo Alto 2030, *Draft Existing Conditions Report: Population, Housing and Employment* (2014), 10-5, 10-6

Residents age 65 and older constitute 17.1% of Palo Alto's population. This is a larger portion than the share for Santa Clara County as a whole, which is 11%. Palo Alto's population is also aging; the median age in 2010 was 41.9 years old, compared to 31.6 in 1970. Between today and 2030, the number of residents older than 65, the average age, and the share of children are all expected to continue to increase.

The ethnic make-up of Palo Alto's population is shifting, with a decrease in persons identifying themselves as Caucasian and an increase in the proportion of people who self-identify as Asian. In 2000, 72.8% of the population identified themselves as white, compared to 60.6% in 2010. Conversely, 17.2% of Palo Alto residents identified as Asian in 2000; this increased to 27% in 2010. These trends are expected to continue both in Palo Alto and throughout the Bay Area.

Income in Palo Alto is consistently higher than for surrounding communities in Santa Clara County. Palo Alto's median household income increased to $122,482 in 2012, compared to $90,747 in Santa Clara County overall.

Palo Alto boasts consistent job growth and low unemployment rates. More than 110,000 jobs are projected in Palo Alto by 2030, a 24% increase from the number of jobs in 2010. Employment density in Palo Alto (Figure 32) is concentrated in the University Avenue and California Avenue areas, the Page Mill Road corridor including the Stanford Research Park, and in the southeast part of the city near Fabian Way and San Antonio Road.

Figure 32 Employment Density in Palo Alto

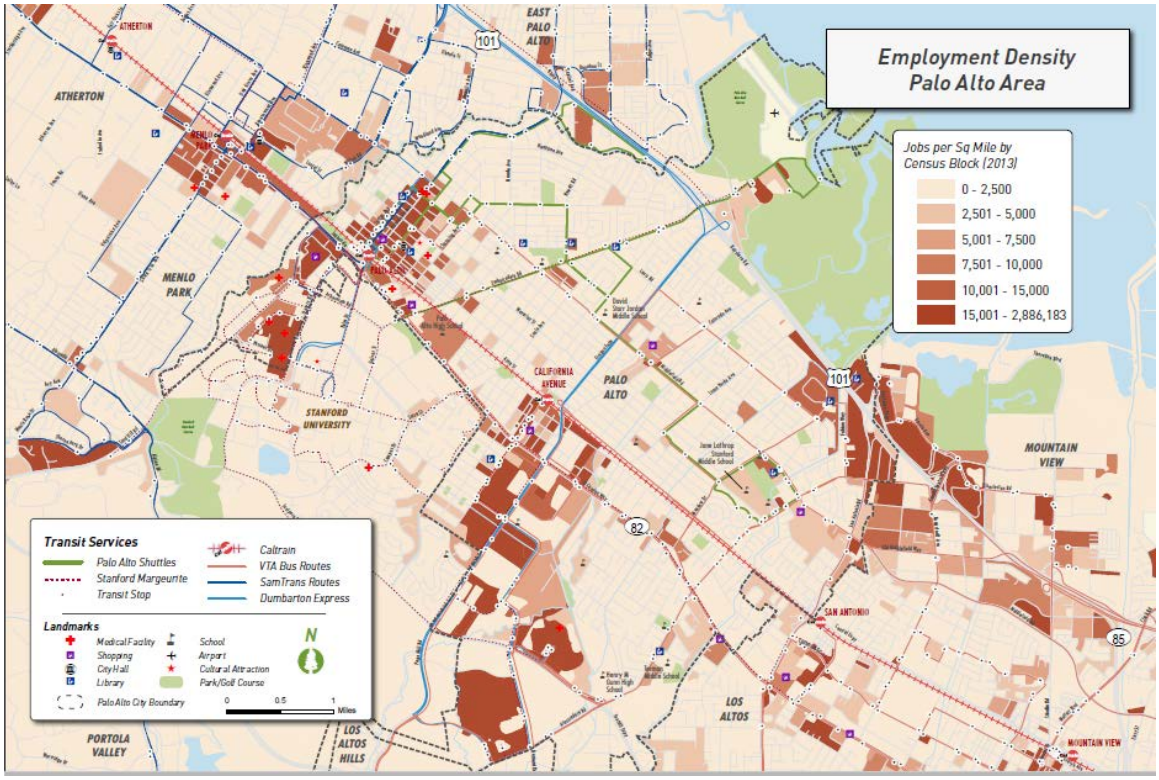


Figure 33 Transportation Goals of the Current Comprehensive Plan[15]

Transportation Goals	
Goal T-1	Less reliance on Single-Occupant Vehicles
Goal T-2	A convenient, efficient public transit system that provides a viable alternative to driving
Goal T-3	Facilities, services, and programs that encourage and promote walking and biking
Goal T-4	An efficient roadway network for all users
Goal T-5	A transportation system with minimal impacts on residential neighborhoods
Goal T-6	A high level of safety for motorists, pedestrians and bicyclists
Goal T-7	Mobility for people with special needs
Goal T-8	Attractive, convenient public and private parking facilities
Goal T-9	An influential role in shaping and implementing regional transportation decisions
Goal T-10	A local airport with minimal off-site impacts

[15] Our Palo Alto 2030, *Draft Existing Conditions Report: Transportation and Traffic* (2014), 12-7

APPENDIX B CONCEPT LIST AND SCREENING PROCESS

This concept development and screening process took place in Winter/Spring 2016 during the initial development of concepts, prior to the concept refinement in consideration of the draft VTA Next Network.

Concept Development

Using the established goals and objectives, the findings from the community survey, and analysis conducted regarding existing transit service, a set of more than 20 initial concept ideas were developed to improve the Palo Alto Shuttle system.

These concepts were classified as either new routes, modified routes, or other service improvements. Other service improvements included concepts not directly related to expanded or modified coverage, such as increased frequency, increased service hours, improved reliability, and a campaign to expand awareness and improve the user experience of the shuttle. The full list of initial concepts is included as Figure 34.

This initial concept list was developed with the following market factors and planning parameters in mind:

- Walkshed analysis and existing transit access gaps
- Population and employment densities
- Key activity generators and destinations as identified on the survey
- Ridership trends on existing shuttle services
- School catchment areas (see figures below)
- Residential locations of key user groups (e.g. seniors)

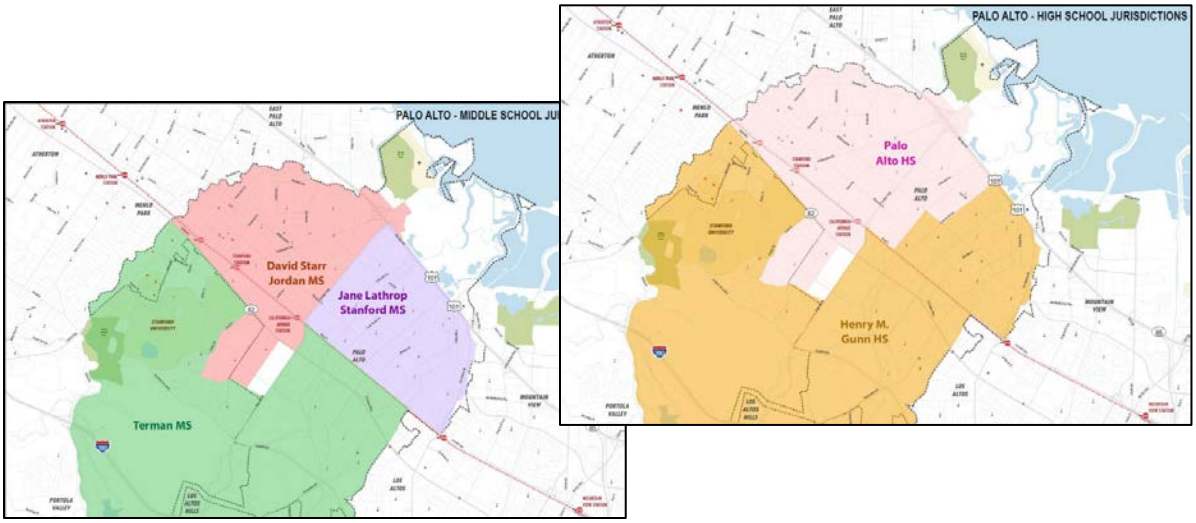


Figure 34 Palo Alto Shuttle Improvement Concepts – Initial List

Concept	Type	Description	Alignment with Goals	Service Characteristics	Key Destinations Served
Southwest Shuttle	New Route Community Circulator; FM/LM	New route with service from Stanford Shopping Center/Apartments to PA Caltrain, Cal Ave Caltrain, Stanford Research Park (Page Mill), VA Hospital, Gunn HS	Convenient and Accessible	Either peak only (to only serve Gunn and commuters) or 7:30am-7:30pm route; consider later service Friday PM (to 10 pm) Frequency: 15 min	Stanford Shopping Center, Palo Alto Caltrain, Cal Ave Caltrain and business district, Page Mill Rd employers, Stanford Research Park, VA Hospital, Gunn High School/Terman Middle
Midtown-San Antonio Circulator + Paly School Tripper	New Route Community Circulator; School Tripper	New route with service between California Ave and San Antonio Shopping Center via Palo Verde and San Antonio transit hub Continues to El Camino and Embarcadero Road for school trips	Convenient and Accessible Frequent and Reliable	Frequency: 15 min peak Additional trip(s) to Paly in accordance with bell schedule	Cal Ave shopping district, Cal Ave Caltrain, Mitchell Park, San Antonio Caltrain, San Antonio Shopping Center
Central PA	New Route Community Circulator	New loop route with service from Stanford Shopping Center/Downtown PA to Fairmeadow via Alma/Bryant	Convenient and Accessible	Frequency: 15 min (perhaps 30 min headway if combined or offered as alternative route to Southwest)	Stanford Shopping Center University Avenue PA and Cal Ave Caltrain stations
Barron Park	New Route Community Circulator	New route with service from within Barron Park neighborhood to downtown PA,	Convenient and Accessible	Frequency: 15 min (perhaps 30 min headway if combined or offered as alternative route to Southwest)	PA Caltrain, PAMF, Town and Country Shopping Center, Barron Park
West Shuttle	New Route Community Circulator; School Tripper	Connects connect South Palo Alto, California Avenue, Paly High School, Town and County Village, the Palo Alto Medical Center, Palo Alto Transit Center, University Avenue, and Stanford Shopping Center via El Camino Real and East Meadow Drive	Convenient and Accessible	Sample schedule includes 20 weekday runs and approximately 24 vehicle revenue hours with two buses in operation.	Palo Alto Caltrain University Avenue Connections to Marguerite Stanford Shopping Center Palo Alto Medical Foundation California Avenue Palo Alto Commons Stevenson House Moldaw Residences
Winter Shopping Trolley	New Route Community Circulator	Connects the University Avenue Downtown Business District with the Stanford Shopping Center	Convenient and Accessible	Pilot project: December park-once shuttle for holiday shopping	Stanford Shopping Center University Avenue

Concept	Type	Description	Alignment with Goals	Service Characteristics	Key Destinations Served
Summer Lunchtime Trolley	New Route Community Circulator	Connects the University Avenue Downtown Business District with the Stanford Shopping Center	Convenient and Accessible	Pilot project: Summer lunchtime trolley for access to dining destinations in Stanford Shopping Center and downtown Requires high frequency (<10 min to be successful)	Stanford Shopping Center University Avenue
Paly School Tripper (North Palo Alto)	New Route School Tripper	Serves Paly students living in downtown North and downtown neighborhoods.	Convenient and Accessible	Extra AM/PM run timed with school schedule	Paly High School North and Old Palo Alto residential neighborhoods
Gunn/Terman School Tripper	New Route School Tripper	Serves Gunn/Terman students living in Stanford housing and in neighborhoods near Stanford	Convenient and Accessible	Extra AM/PM run timed with school schedule	Gunn/Terman schools Stanford University housing
Paly School Tripper (SW Palo Alto)	New Route School Tripper	Serves Paly students living in College Terrace and Evergreen Park neighborhoods.	Convenient and Accessible	Extra AM/PM run timed with school schedule	Paly High School College Terrace and Evergreen Park neighborhoods
Flex Routes	New Route Community Circulator	Serves lower demand areas either spatially or temporally that are not served with fixed route transit	Convenient and Accessible Frequent and Reliable	Potential to serve lower demand residential areas with point to point or point to downtown service	TBD based on extents of service area
Crosstown: Stanford Shopping Center, PAMF Extension + Cubberley Extension	Modified Route Community Circulator	Extends Crosstown route west to Stanford Shopping Center, Town and Country Shopping Center and PAMF; east to loop serving Cubberley Community Center	Convenient and Accessible	Extension to encircle Stanford Shopping Center via Sand Hill, Arboretum, Galvez, El Camino; loop around Middlefield, San Antonio and E Charleston	Existing plus Stanford Shopping Center, Town and Country Shopping Center, PAMF; Cubberley Community Center, Greenmeadow neighborhood, Moldaw Residences
Embarcadero: Bayshore Service	Modified Route - Route and Hours Community Circulator; FM/LM	Diverts Embarcadero route along East/West Bayshore to Fabian Way/San Antonio Road	Convenient and Accessible Frequent and Reliable	Modified route to serve Bayshore, southeast PA All day service at 15 minute headway in peak, perhaps more in off-peak	Greer Park, Fabian Way and W Bayshore businesses, existing Embarcadero shuttle destinations

Concept	Type	Description	Alignment with Goals	Service Characteristics	Key Destinations Served
East Palo Alto: Stanford Shopping Center, PAMF Extension	Modified Route Community Circulator	Extends EPA route west to Stanford Shopping Center, Town and Country Shopping Center and PAMF	Convenient and Accessible	Extension to encircle Stanford Shopping Center via Sand Hill, Arboretum, Galvez, El Camino	Existing plus Stanford Shopping Center, Town and Country Shopping Center, PAMF
East Palo Alto: 101 Extension	Modified Route	Extend EPA route across US 101 and further into East Palo Alto	Convenient and Accessible	Could either be a new additional route, or could be alternated with existing route for 1 hr headway vs 30 min headway	East Palo Alto, Palo Alto Caltrain, downtown PA
Crosstown: Hours Extension - Weekends	Other Service Improvement - Weekend Service	Implement weekend service for shopping, dining opportunities as well as access to Main Library, Mitchell Park, and other community centers	Frequent and Reliable	Options exist for all day service or just evening service	Same as existing route
Crosstown: Hours Extension - Evenings	Other Service Improvement - Extend Weekday Operating Hours	Extend Crosstown service into the evening to facilitate evening commute use and car free access to downtown dining and shopping	Frequent and Reliable	Extend Crosstown route hours to 7:30 pm M-Th; to 10 pm Fri	Same as existing route
Crosstown: Frequency Increase	Other Service Improvement - Weekday Peak Period Frequency	Increase all day frequency on Crosstown route to 15 min headways; currently 30 min headway in non peak, hourly in peak One additional Jordan Middle route run in AM and PM	Frequent and Reliable	15 min headway or better; schedule designed to meet Caltrain arrivals/departures True first mile/last mile would require as many runs as Embarcadero Shuttle	Same as existing route
East Palo Alto: Hours Extension	Other Service Improvement - Midday Service	Extend EPA route hours in midday weekday and weekend	Frequent and Reliable	Closing gap on midday service from EPA to downtown	Same as existing route
Marketing and Communications Campaign	Other Service Improvement	Develop and implement marketing and communication improvements for existing shuttle services	Visibility and Ease of Use		
Existing Shuttle Reliability Study	Other Service Improvement	Invest in study of reliability issues for existing shuttle routes	Frequent and Reliable		
Schedule and Operations Review	Other Service Improvement	Invest in review of existing schedules, opportunities for coordination and transfer between Palo Alto shuttle and other operators	Visibility and Ease of Use		

The concepts were screened against known operational constraints including street design and roadway configurations (e.g. one-way streets and designated bike boulevards) in addition to the criteria listed below:

- **Ridership Potential**: does the route serve multiple activity generators or key destinations in Palo Alto?
- **Ability to Serves Target User Groups**: does the route serve multiple user groups, including seniors, students, employees and residents?
- **Expand Transit Access**: does the route expand the transit service area in Palo Alto and avoid overlap with existing services?
- **Address Survey Requests**: does the route address requests we heard in the survey?
- **Level of Resources Required**: does the route require significant resources or is it easily-implementable?

Points were assigned in each criteria category corresponding to a low, medium or high score. Characteristics for each score category are outlined in Figure 35.

Figure 35 Shuttle Improvement Concept Screening Criteria

Criteria	Low – 1 Point	Medium – 2 points	High – 3 points
Ridership Potential	< 5 activity generators on route Low employment and population density	6-10 activity generators on route Moderate population and employment density	11+ activity generators on route Significant high population and employment density
Ability to Serve Target User Groups	One user group reached	Two user groups reached	3-5 user groups reached
Expands Transit Access	Significant overlap with existing service Nearby population already has transit within quarter mile	Some new corridors/streets served Provides some new quarter-mile transit access	Mostly new corridors/streets served Addresses many gaps in transit access
Addresses Survey Requests	Does not address key destinations/categories of survey responses	Addresses one key destination/category of survey responses	Addresses multiple key destinations/categories of survey responses
Level of Resources Required	Anticipated to be very resource intensive	Moderate level of resources required	Requires reasonable level of financial/staff resources to implement

Following the screening and scoring exercise, the concepts were placed into Tiers 1 through 3, with Tier 1 concepts most closely aligning with the goals (as described in Chapter 5) and practical constraints of the shuttle program. Concepts were also separated into near-term concepts (primarily modified routes and other service improvements, such as frequency and hours of operation) and mid to long-term concepts (primarily new routes).

Figure 36 outlines the scoring process and shows the scores assigned to each initial concept, as well as the tiered outcomes. Tier 1 concepts, including new routes and modified routes, were further refined and shared at the community meetings in March 2016.

Figure 36 Shuttle Concept Screening Process and Assigned Scores

Palo Alto Shuttle Initial Concepts		Concept Screening High - 3 points, Medium - 2 points, Low - 1 point * Inverse weighting						
Tier	Concept	Ridership Potential	Serves Target User Groups	Expands Transit Access	Addresses Survey Requests	Level of Resources Required*	Total Points	Ranking Notes
Tier 1	Southwest Shuttle	3 Low to Moderate population density; high employment density; about 12 activity generators	3 Seniors, students, employees FM/LM to research park, residents	2	2	1	11	Tier 1 because of potential new ridership, multiple user groups served and addressing survey requests
Tier 1	Midtown-San Antonio Circulator + Paly School Tripper	2 Moderate to high population density; low to moderate employment density; about 7 activity generators	3 Seniors, students, PA employees, residents	2	2	1	10	Tier 1 because of gaps filled in transit access, number of target user groups served and addressing survey comments.
Tier 1	Embarcadero: Bayshore Service	2 Moderate population density; moderate employment density; about 6 activity generators	2 Seniors, residents, PA employees	3	2	2	11	Tier 1 because of significant closure of transit access gaps, multiple target user groups served and moderate resources required
Tier 1	Crosstown: Stanford Shopping Center, PAMF Extension + Cubberley Extension	2 Moderate population density; moderate employment density; about three activity generators	2 Seniors, residents, PA employees	2	3	3	12	Tier 1 because low anticipated resources required, addresses frequent survey requests and while there is some existing transit overlap, it serves senior population where one seat ride is important

Palo Alto Shuttle Initial Concepts		Concept Screening High - 3 points, Medium - 2 points, Low - 1 point *Inverse weighting						
Tier	Concept	Ridership Potential	Serves Target User Groups	Expands Transit Access	Addresses Survey Requests	Level of Resources Required*	Total Points	Ranking Notes
Tier 1	Crosstown: Hours Extension - Evenings	3 Same ridership potential as Crosstown, plus evening commuters	2 Seniors, PA employees, residents	1	3	2	11	Tier 1 because of additional ridership potential, addressing frequent survey comments and moderate level of resources required
Tier 1	Crosstown: Frequency Increase	3 Same ridership potential as Crosstown, plus evening commuters	2 Seniors, PA employees, residents	1	3	2	11	Tier 1 because of potential to increase ridership, address survey requests and moderate level of resources required
Tier 2	Central PA	2 Moderate population density; moderate employment density; about 6 activity generators	2 Seniors, PA employees, residents	3	1	1	9	Tier 2 due to infeasibility of route due to non-thru streets other than bike blvd Bryant, car thoroughfare Alma
Tier 2	Barron Park	2 Low to moderate population density; moderate employment density; about 6 activity generators	2 Seniors, PA employees, residents	2	2	1	9	Tier 2 due to high survey response but low density neighborhood.

Palo Alto Shuttle Initial Concepts		Concept Screening High - 3 points, Medium - 2 points, Low - 1 point *Inverse weighting						
Tier	**Concept**	**Ridership Potential**	**Serves Target User Groups**	**Expands Transit Access**	**Addresses Survey Requests**	**Level of Resources Required***	**Total Points**	**Ranking Notes**
Tier 2	West Shuttle	2 Moderate population density; moderate employment density; about 5 activity generators	2 Seniors, PA employees, residents	1	2	1	8	Tier 2 due to transit overlap but moderate population and employment density in the area.
Tier 2	Winter Shopping Trolley	2 Moderate population density, high employment density; about 4 activity generators	2 Seniors, residents	1	1	2	8	Tier 2 due to transit overlap but moderate population and employment density in the area.
Tier 2	Summer Lunchtime Trolley	2 Moderate population density, high employment density; about 4 activity generators	2 Seniors, residents, PA employees	1	1	2	8	Tier 2 due to transit overlap but moderate population and employment density in the area.
Tier 2	East Palo Alto: Stanford Shopping Center, PAMF Extension	2 Moderate population density; moderate employment density; about three activity generators	2 Seniors, residents, PA and EPA employees	1	2	1	8	Tier 2 due to resources and coordination required but moderate population density and transit access expansion.

Palo Alto Shuttle Initial Concepts		Concept Screening High - 3 points, Medium - 2 points, Low - 1 point *Inverse weighting						
Tier	**Concept**	**Ridership Potential**	**Serves Target User Groups**	**Expands Transit Access**	**Addresses Survey Requests**	**Level of Resources Required***	**Total Points**	**Ranking Notes**
Tier 2	Crosstown: Hours Extension - Weekends	2 Same ridership potential as Crosstown	2 Seniors, PA employees, residents	1	2	2	9	Tier 2 due to unclear market demand
Tier 3	Paly School Tripper (North Palo Alto)	2 Includes catchment area but depends on student enrollment	1 Students	2	2	2	7	Tier 3 because of unknowns related to ridership potential
Tier 3	Gunn/Terman School Tripper	2 Includes catchment area but depends on student enrollment	1 Students	2	2	2	7	Tier 3 because of unknowns related to ridership potential
Tier 3	Paly School Tripper (SW Palo Alto)	2 Includes catchment area but depends on student enrollment	1 Students	1	2	2	6	Tier 3 because of unknowns related to ridership potential
Tier 3	Flex Routes	Dependent on geographic extents	Dependent on geographic extents	Dependent on geographic extents	Dependent on geographic extents	1		Tier 3 because of unknowns related to ridership potential, cost and operating plans

Palo Alto Shuttle Initial Concepts		Concept Screening High - 3 points, Medium - 2 points, Low - 1 point *Inverse weighting						
Tier	**Concept**	**Ridership Potential**	**Serves Target User Groups**	**Expands Transit Access**	**Addresses Survey Requests**	**Level of Resources Required***	**Total Points**	**Ranking Notes**
Tier 3	East Palo Alto: 101 Extension	2 Moderate to high population density; moderate employment density; about three activity generators	2 Seniors, residents, PA and EPA employees	1	1	1	7	Tier 3 because of transit overlap, low response rate on survey and coordination required.
Tier 3	East Palo Alto: Hours Extension	2 Same geographic extents as current EPA	2 Seniors, PA and EPA employees, residents	1	1	1	7	Tier 3 because of coordination required and low response rate on survey.
Tier 1	Marketing and Communications Campaign							Recommended to address 200+ survey comments related to lack of awareness and potential increase ridership with relatively small investment.
Tier 2	Schedule and Operations Review							Could benefit legibility and cost-effectiveness of existing and future routes.
Tier 3	Existing Shuttle Reliability Study							Reliability becomes less important with significant frequency increases.

Yellow highlighting indicates variables with significant unknown details.

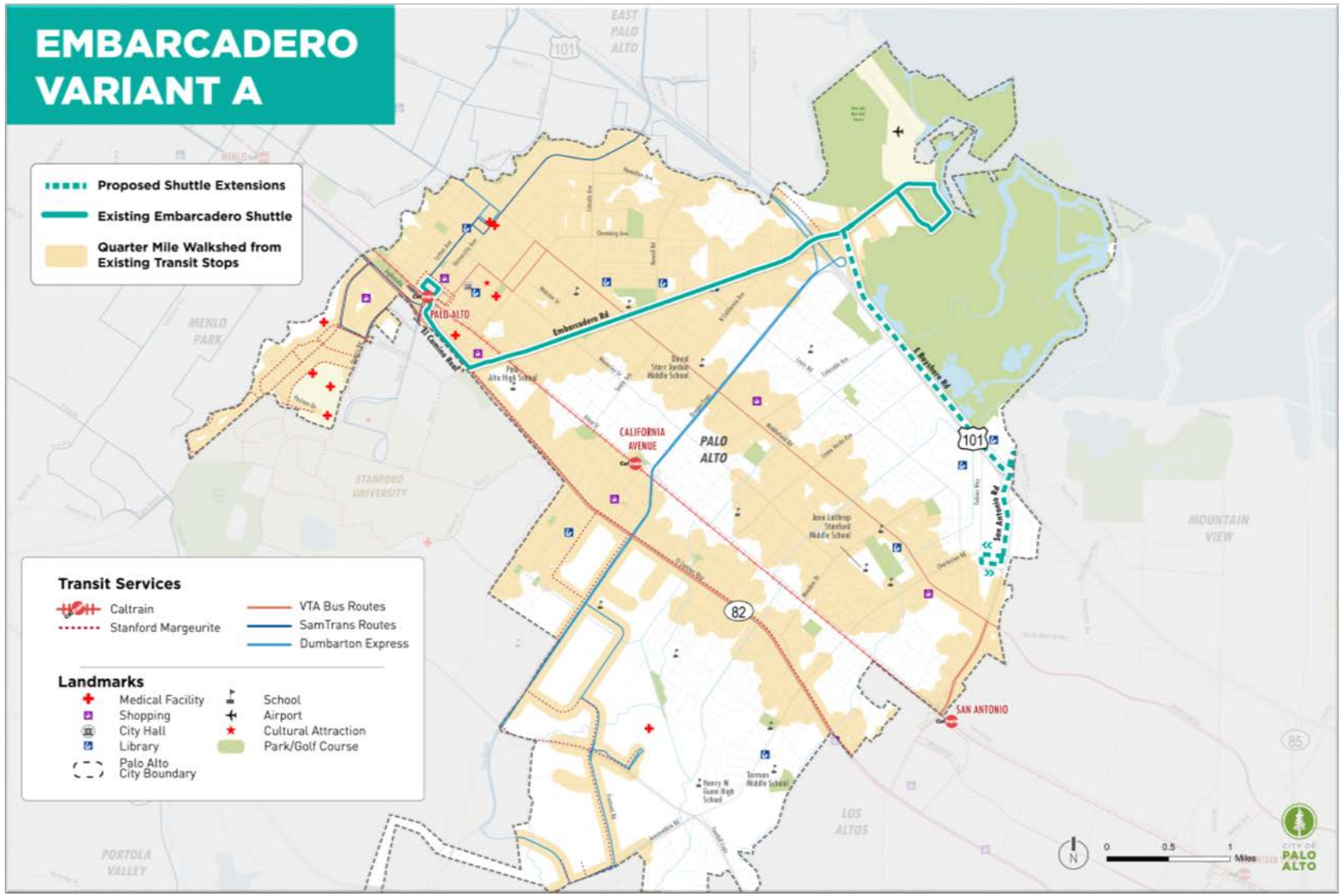
APPENDIX C OTHER ROUTE VARIANTS CONSIDERED

EMBARCADERO ROUTE VARIANTS

Embarcadero Route Variant A retains the current Embarcadero route, extending it beyond Palo Alto Technology Center along East Bayshore before turning around at Charleston/Fabian to a return trip via Embarcadero Road to Palo Alto Caltrain.

Embarcadero Modification Variant A Specifications	
Primary Route Type	First/Last Mile and Community Circulator
Round-Trip Route Length	13.4 miles
Round-Trip Cycle Time	60 minutes
Vehicle Requirements	4 vehicles for 15-minute service 2 vehicles for 30-minute service 1 vehicle for 60 minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Palo Alto Caltrain* Downtown Palo Alto* Town & Country Village* Paly High School* Lytton Gardens Rinconada library Palo Alto Technology Center Palo Alto Municipal Service Center Palo Alto Animal Services Businesses near San Antonio Road/E Charleston Road Senior residences/centers*

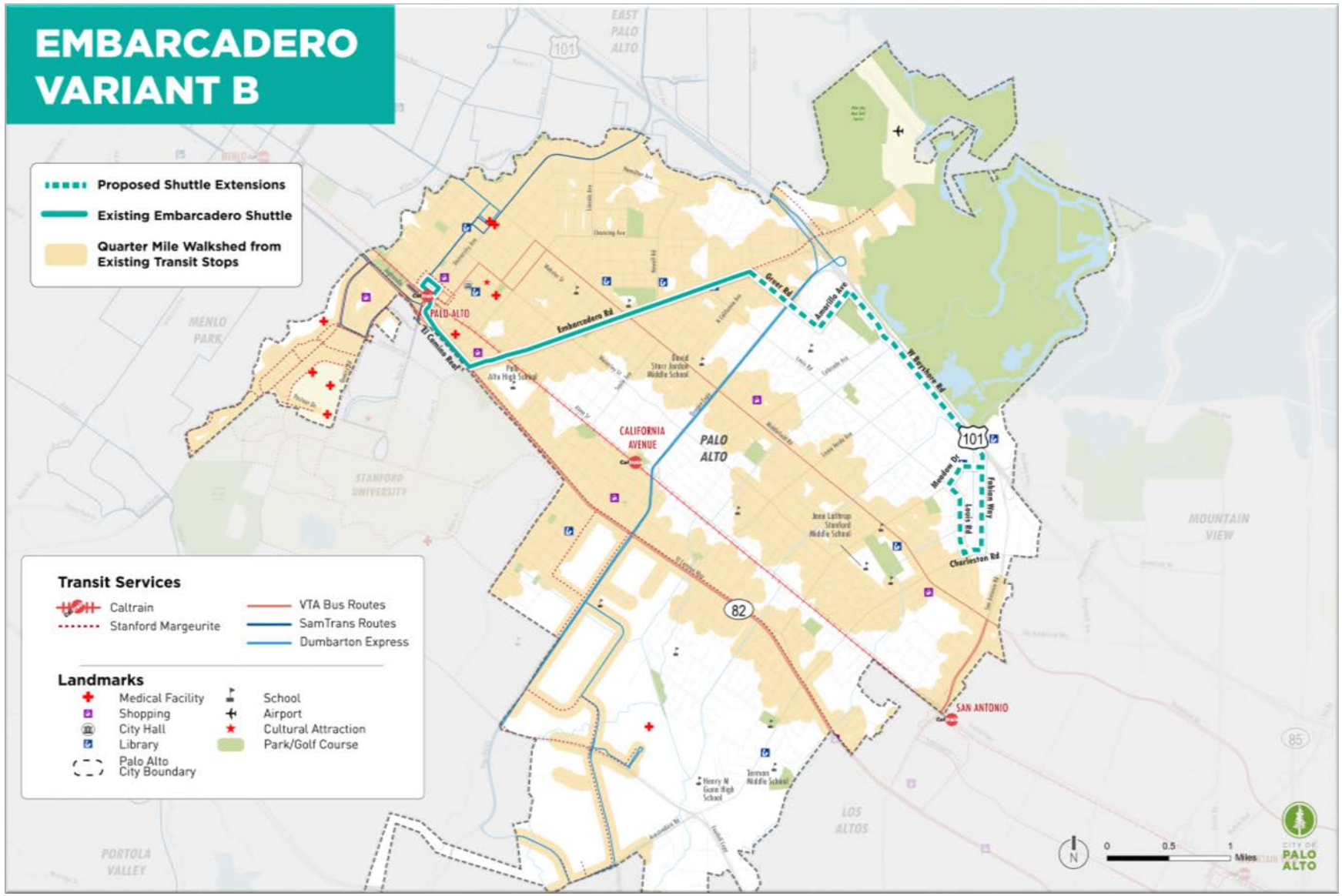
Figure 37 Embarcadero Route Variant A



Embarcadero Route Variant B removes service to Palo Alto Technology Center and areas east of Highway 101 in favor of providing service along West Bayshore Road with a loop at Fabian/Charleston. Embarcadero Variant B aims to fill existing service gaps in the Greer Park/Midtown neighborhood and serve senior residences and employment centers.

Embarcadero Variant B Specifications	
Route Type	Community Circulator
Round-Trip Route Length	10.6 miles
Round-Trip Cycle Time	50 minutes
Vehicles Requirement	4 vehicles for 15-minute service 2 vehicles for 30-minute service 1 vehicle for 40-60 minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Palo Alto Caltrain* Downtown Palo Alto* Town & Country Village* Paly High School* Lytton Gardens Rinconada library Greer Park Businesses near San Antonio Road/E Charleston Road/Fabian Way Senior residences/centers*

Figure 38 Embarcadero Route Variant B

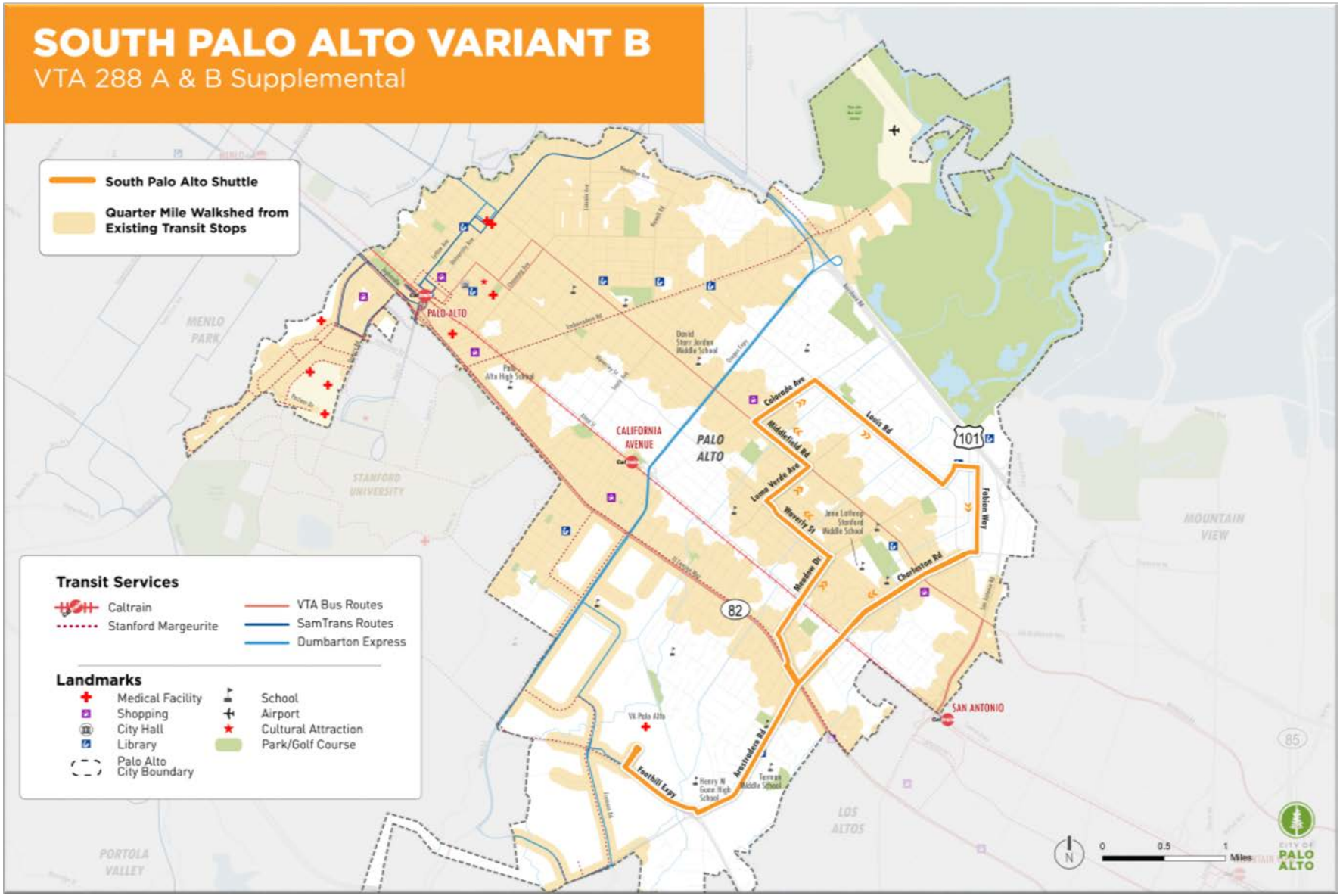


SOUTH PALO ALTO ROUTE VARIANTS

South Palo Alto Variant B provides all-day duplication of proposed VTA routes 288A and 288B which would provide only school bell service (3 AM and 3 PM trips). This route loops through Midtown neighborhood via Louis Road, Colorado Avenue, and Middlefield Road.

South Palo Alto Variant B Specifications	
Route Type	Community Circulator
Round-Trip Route Length	10.4 miles
Round-Trip Cycle Time	60 minutes
Vehicles Requirement	4 vehicles for 15-minute service 2 vehicles for 30-minute service 1 vehicle for 40-60 minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Midtown Palo Verde neighborhood Mitchell Park and Library* Senior residences/centers* Terman Middle School* Gunn High School* VA Hospital

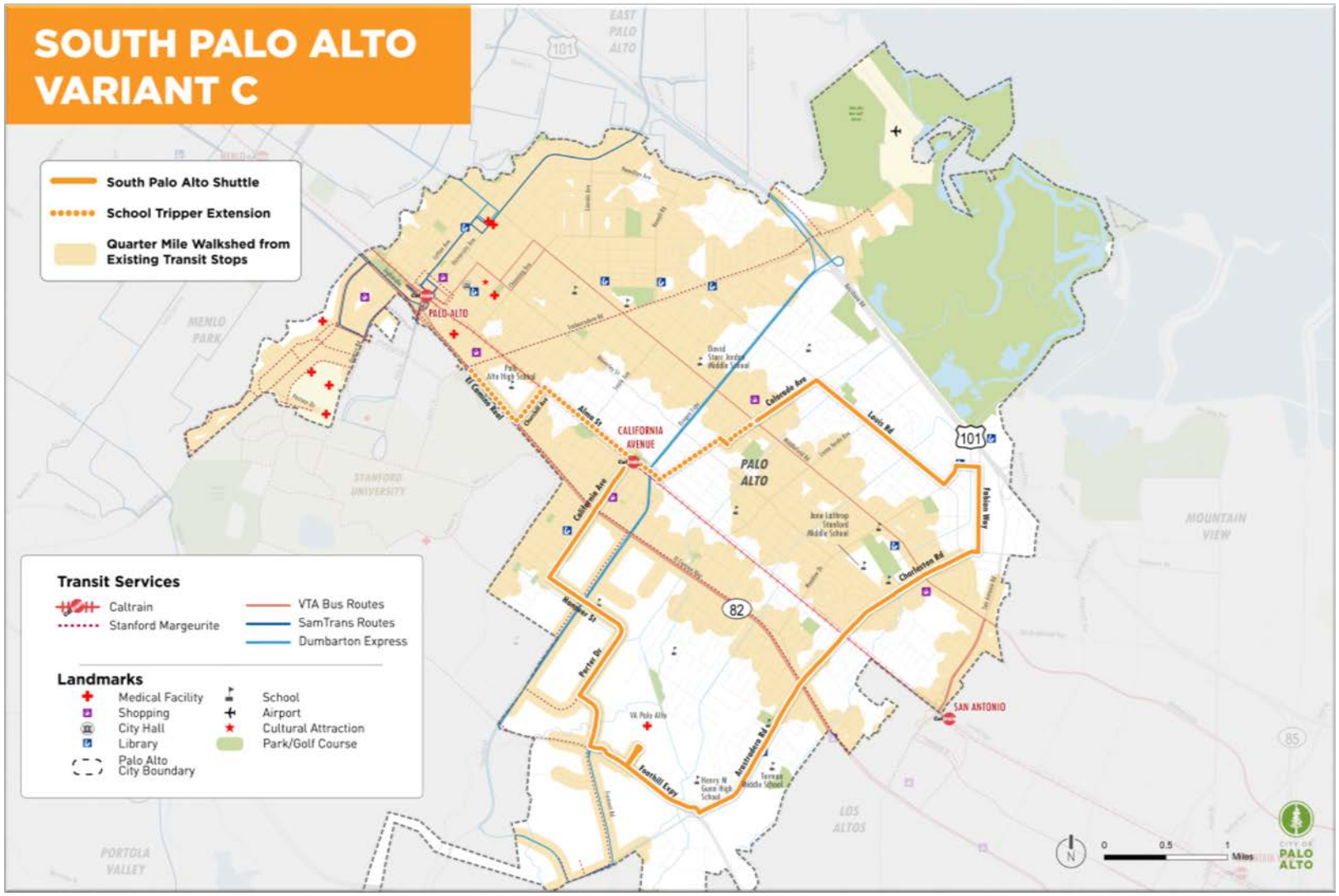
Figure 39 South Palo Alto – Variant B



South Palo Alto Variant C terminates at Midtown Shopping Center and California Avenue Caltrain station. This nearly circular route travels along Louis, Fabian, E Charleston, Arastradero, Foothill Expressway, and Page Mill Road. The routes includes a school tripper extension from Midtown Shopping Center to Palo Alto High School (3 AM and 3 PM trips).

South Palo Alto Variant C Specifications	
Route Type	Community Circulator
Round-Trip Route Length	16.5 miles
Round-Trip Cycle Time	75 minutes
Vehicles Requirement	7 vehicles for 15-minute service 4 vehicles for 30-minute service 2 vehicles for 40-60 minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Midtown Shopping Center Midtown neighborhood Palo Verde neighborhood Mitchell Park and Library* Senior residences/centers* Terman Middle School* Gunn High School* VA Hospital Stanford Technology Center* California Ave Caltrain*

Figure 40 South Palo Alto – Variant C



SOUTHWEST ROUTE

Lastly, the **Southwest route** would provide service from downtown Palo Alto and the Stanford Medical Center/Shopping Center area to Old Palo Alto (currently unserved or underserved by transit), California Avenue, College Terrace, and along Page Mill Boulevard to serve Stanford Research Park and then south to the VA Hospital and Gunn High School/Terman Middle School. With the proposed elimination of VTA route 89, the Southwest Route may present as an important opportunity for future expansion of the system. This route would also provide a one-seat fare free ride between downtown Palo Alto and California Avenue shopping districts, as well as being able to serve portions of Old Palo Alto that today do not have transit within a quarter-mile walk. Initially the route would operate during weekday peak periods to serve employees and students. Over time, service would be added midday and extended further into the evening as well as on weekends.

Southwest Route Specifications	
Route Type	Community Circulator
Round-Trip Route Length	18.1 miles
Round-Trip Cycle Time	60 minutes
Vehicle Requirements	4 vehicles for 15-minute service 2 vehicles for 30-minute service 1 vehicle for 60 minute service
Destinations (* indicate key destinations identified in the community survey and shown in Figure 18)	Stanford Medical Center* Stanford Shopping Center* Palo Alto Caltrain* Downtown Palo Alto* Old Palo Alto neighborhood California Avenue* California Avenue Caltrain* College Terrace Stanford Research Park* VA Palo Alto Gunn High School* Terman Middle School*

Figure 41 Southwest Route